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Reverberatory Furnaces.

BY R. H. PALMER.

In the management of reverberatory furnaces each one will have his own ideas, formed and governed by his actual experience in their operation, or influenced by the opinions of others and the results obtained by them.

In the construction of furnaces it is seldom that two are built alike, because individual experience gives preference to certain modifications. One may condemn a form of construction that another finds to his advantage to retain because conditions are not the same.

In running off a given quantity of metal, one may prefer a small furnace and take off quite a number of heats per day. Another will employ a larger furnace and operate it less frequently. Each method will require a different system of management.

As in other things, one gains his experience by carefully watching the working of the furnace under different conditions. Thus he finds that if the wind is in a certain quarter the furnace will work better; with a furnace using only natural draft this is always sure to be the result. In a furnace where a blast is used with the wind a certain way he can get along better with less blast; while a reversal of these conditions will force him to use more blast. The nearer one can approach a natural draft the better the results as far as the metal is concerned.

Again in watching the management of the furnace during melting, one does not let his watching stop when the furnace is tapped; he watches the iron as it is being poured, its action in the ladle and its fluidity. Not only are the test pieces examined, but the castings and the gates as well. In short, it is only by careful observation that the best results are obtained.

I will call attention to two kinds of reverberatory furnaces—one using a blast, the other natural draft. In building a furnace in a new locality, the height of the stack is governed not only by the location of the furnace and surrounding objects as well, but by the fuel that is to be used.

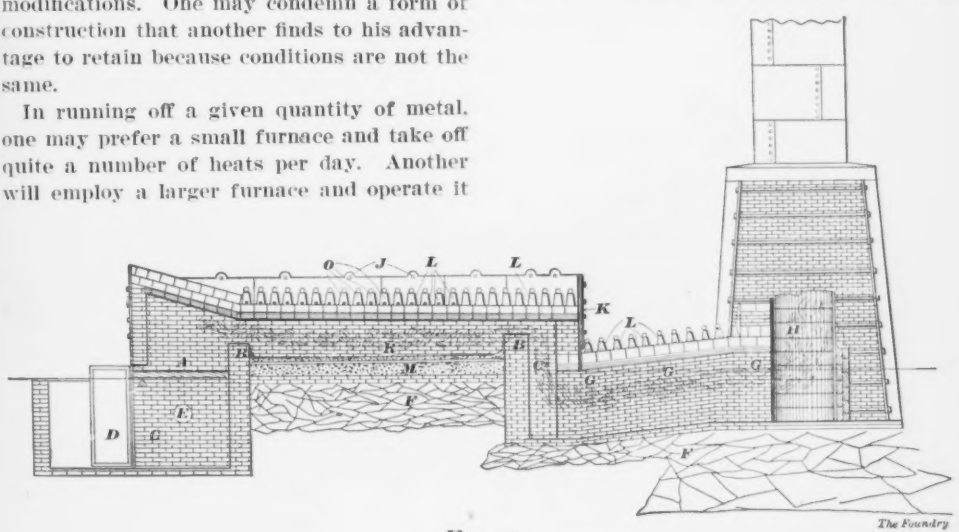

FIG. 1

In a reverberatory furnace the grate surface and the depth of grate bars below top of bridge-wall, the pitch of the roof to deflect the flame on the metal, the throat to the flue, the pitch or slope of hearth and, if blast is used, the quantity, must all be considered. The last of these often has to be altered a number of times.

In the furnace shown in Fig. 1, A shows the grate bars, B bridge-wall, C ashpit, D ashpit doors, E opening where blast enters, F stone foundation, G flue and H stack.

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Above the stone work are two courses of brick, on which rests the stringers of iron, bolted together, to which plates forming the sides of the furnace are bolted, the bolt holes J J being intended for the insertion of tie-rods.

The front of furnace is of iron, as is also the back plates K. The top or roof of fireplace is arched over with fire brick (that is over the grate surface) and pitched down toward hearth R. Over the hearth the roof is constructed of arches of fire brick, held in a cast-iron form by a boltrod running through it, the whole being termed a bung as L. The flue G is also covered the same way. Between bridge walls and side walls sand is filled in to point M, and above this point the bottom, or hearth, is two inches thick, made from a mixture of ground silica rock one part, and silica sand two parts, mixed well and tamped down with a rammer.

A fire is then built and the bottom is set, as it is termed, which consists in bringing it to a red heat and fusing it together. This bottom, or hearth, is sloped from each end toward the tap-hole, so that all of the iron may easily be drawn from the furnace.

In looking at Fig. 2, the firing door will be seen at B, charging door at C, and the second charging door raised at D. These doors are of cast-iron and are lined with fire brick and are raised and lowered by levers C, counterbalanced.

To the left of these doors is tap-hole E. On the right hand side of the doors is pouring spout F. The clapper H, which falls over peephole in doors at H and J, is large enough to put bars through to stir or puddle the iron when wished.

A general idea of the inside of the furnace looking down on top of it may be obtained from Fig. 3. A is grate bars, H hearth, S stack 75 feet in height. This style of stack is of boiler-iron, lined with fire brick and anchored in brick work at the bottom, although many prefer a brick stack bound with rods and iron plates at corners, after the method shown in bottom of Fig. 1. Across the top of the furnace may be seen some of the bupngs T and tierods R, Fig. 3.

In Fig. 1 it will be noticed that the roof over the firebox, or grate surface, is pitched toward the hearth. This is done to help pitch the flame as it passes over the bridge-wall B down on to the iron. As the roof over the hearth is also arched, and is slightly lower at the back end than at the front or bridge end, this construction causes not a straight wave motion of flame up and down, but a whirling, eddying series of billows of flame dipping down on to the iron, whirling and roaring along, reminding one of the whirlpool rapids at Niagara in flame on a small scale. The more the flame can be made to follow this motion, the better satisfaction will the furnace give in operation.

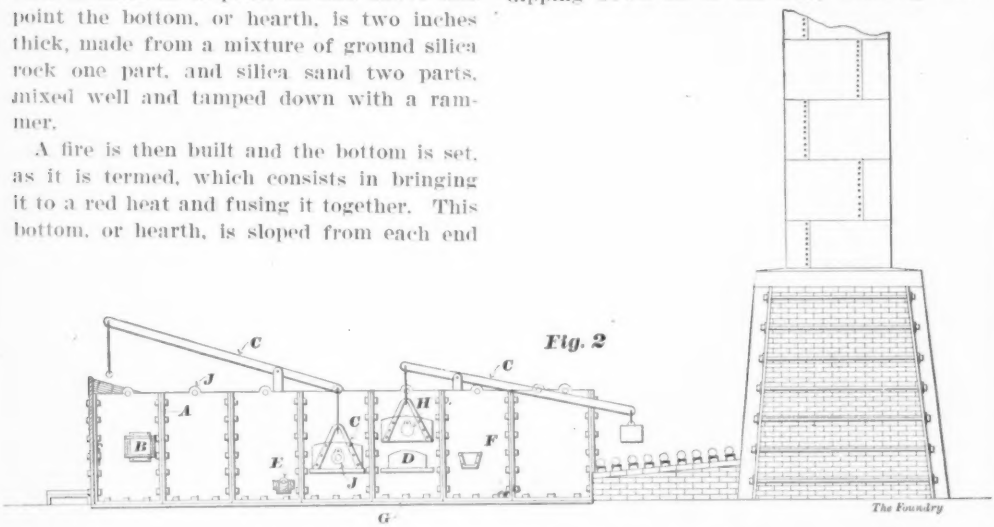

Fig. 2

I have tried in Fig. 1, by drawing a number of lines from fireplace to stack, to give some idea of what I mean, but know it is a poor attempt, and one must draw largely on imagination to obtain a true picture of a furnace in operation. The melter is pleased to see the above kind of a flame, because he knows his work will be shortened thereby. The foreman is equally pleased because he knows just what kind of a heat he is going to obtain and can calculate accordingly.

In the management of this furnace it was first intended to use natural draught and melting by that alone. A number of experiments were tried, but the iron was not hot

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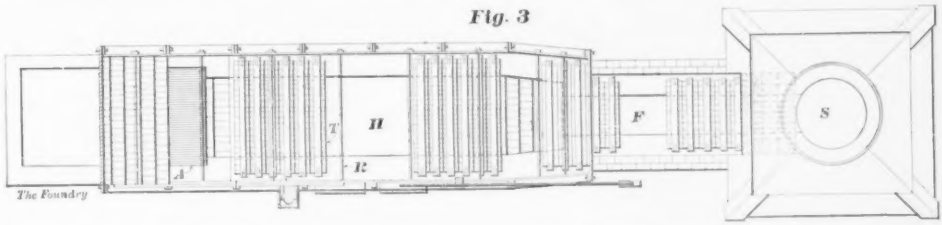
enough to run the work, and finally a low pressure of blast was introduced at E. This gave better results and the grate bars were lowered. The amount of iron melted at a heat varied from 4,500 to 8,000 pounds.

In starting the furnace the bungs are hoisted off and nuts on ends of rods running through, and holding them together as O, Fig. 1, are tightened and the bricks replaced where needed. When the furnace is cleaned out and put in shape the breast is rebuilt,

Fig. 3



spout lined, any patching needed done, grate bars put up, pit cleaned out and fire prepared for lighting.

Two ways of charging the furnace were tried. One when cold before the fire was started and the other after the furnace had become well heated. The best results were obtained with the furnace charged hot.

In charging the furnace cold the iron was simply piled as wished before the bungs were put on. After these were placed and all the crevices daubed up, the fire was lighted and doors to ashpit left open for about an hour, when they were closed and a light blast turned on. In this way natural draft was used at first. By the time the fire was lighted it would be 9 or 9:30 a. m. The fire was stirred through firing door B, Fig. 2, every eight or ten minutes, and fuel added every fifteen minutes, the firing hole being kept covered when not in use. The iron would be melted on an average about 2:45 p. m., skimmed and test taken. Sometimes the iron is given a second skimming, if necessary. The iron is mixed or rubled by the use of a long bar turned on end through charging door D, Fig 2, through which the skimming is also done. The rubling consists in pushing the turned-up end of bar back and forth in the melted iron, thus stirring and mixing it.

In taking tests a small dipping ladle is used through door D. Usually holes are punched in a pail of sand some 7-8 of an inch in diameter and say 6 inches deep, and poured full of iron. When these pieces are cooled down to a black heat, they are broken as a test. The determination as to whether the iron is fit to be poured into castings or not is decided by the mottled white appearance of the fracture. If the mixture of iron is not right when put into the furnace, the test shows it. If not right when melted, then the metal is held in the furnace until it assumes the right appearance. It may take thirty minutes after melting it to get it to the desired point, seldom more if the original mixture is right, or it may have to be run longer if the mixture is wrong and comes gray.

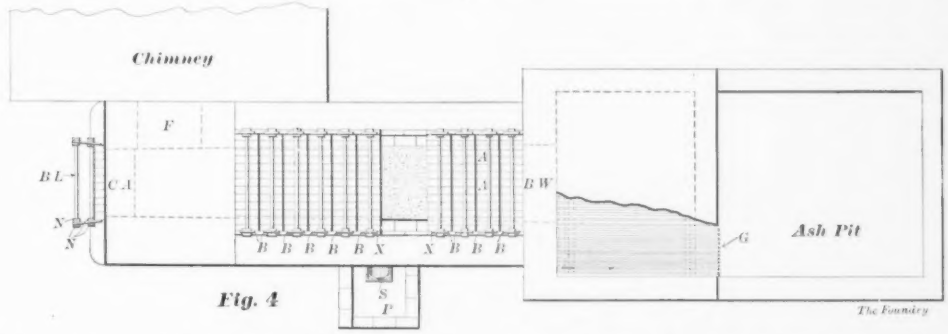


Fig. 4

The second way of charging consisted in firing the furnace and charging it hot by the use of peel, the furnace being started at the usual time, say 9:30 a. m. Natural draft was used and the furnace run until 11:30 a. m., at which time the iron was charged, when it would be melted at about 2:45 to 3 p. m.

A saving of coal was shown in charging hot, as the forced blast was not used as long, while the speed in melting was about the same.

Figs. 4 and 5 show a reverberatory furnace operated by natural draft. From this furnace there are taken five heats per day, of 3,000 pounds each, the furnace being run every second day. The day it is run the melter's helper comes in about 1 a. m. and fires the furnace. It is run until 4 a. m., when additional help comes in and it is charged. The iron is melted and ready to pour at about 7:15 a. m.; after pouring the furnace is immediately charged again, and so it continues until the last heat, which is ready between 5 and 6 p. m. Westmoreland coal is used in both furnaces, and the time of obtaining the first metal is about the same in each furnace, but the first is run say 6 1-2 to 7 hours and the second some 16 to 16 1-2 hours. The first, as near as I can remember, required some 5,300 pounds of coal to melt from 6,000 to 7,000 pounds of iron. The second furnace, running off five heats per day, shows a little less than three pounds of iron for a pound of coal.

Fig. 4 gives top view of the furnace. G grate bars, B W bridge-wall, A A bricks in bungs B B, two of the latter being removed at X X; F flue, S spout.

Under the hearth, bed or bottom, as this part of the furnace is called in different parts of the country, is some six inches of a coarse sand and nothing is better than fire sand. Below bottom in Fig. 5 is seen dotted line S, which is this sand, and under this is brick work reaching down to the stone foundation.

In getting the furnace ready one day for its next day's work the bungs are lifted by hand, as they are small, measuring about 32 inches in length. The furnace is then thoroughly cleaned out as previously mentioned.

If any of the sand at S, Fig. 5, is needed, it is, if possible, put in while the furnace is warm, so it may dry out and bake together. Next the top bottom, I might call it, or hearth, is prepared with a mixture of fire sand and red clay. In mixing material for this bottom if too much clay is added to the sand it will crack when drying and, when the iron is melted on it, this will find its way through these cracks and float the bottom up: this is called in the foundries coming up. With the right quantity of clay and sand these materials are wet with water until they are about the consistency one would want for daubing ladles, possibly a little thinner. This mixture is then spread on top of the sand with a trowel to a thickness of about two inches.

Fig. 6

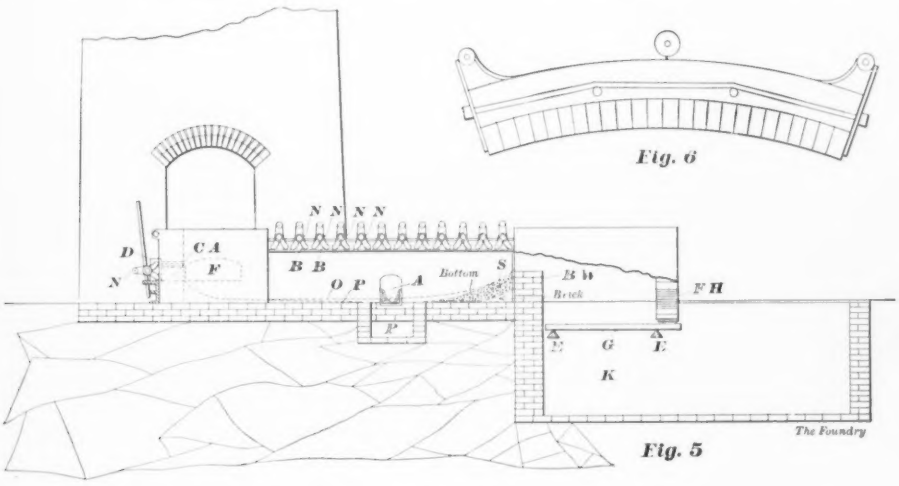


Fig. 5

In Fig. 5 I have drawn a dotted line P, showing the line of bottom when finished as it slopes from bridge-wall B W toward taphole A; also dotted line O, showing line of back of bottom sloping toward the front of furnace.

In Fig. 5 at E E will be seen the bearers on which grate bars rest. When through running the furnace the grate bars are pulled out in front, thus dumping the fire on them, a special pair of tongs being used for the purpose.

After the breast has been put in or made up many shops do not plug the tap hole, but let it remain nearly stopped up with a bar until some of the iron commences to melt, as if the breast is built, and when set, plugged up with the regular mixture, sometimes the plug will give out and the furnace start leaking and give trouble during the heat, but in using a bar and keeping watch so the iron shall not run down and melt on to the bar, it works very nicely in this way.

It will be seen that the spout of this furnace is very nearly on a level with the floor, hence the need of the pit P, Figs. 4 and 5.

In charging this furnace, the bung B L in end is removed and pig iron is charged through opening c a, Figs. 4 and 5, by the use of peel through the end of the furnace. This perhaps will be understood better by looking at Fig. 7. Gates are charged in at top of furnace by removing two of the bungs. Some are also charged at the end.

The iron is poured back into furnace through opening made by leaving out part of a brick in one of the bungs. In dipping for tests with ladle seen hanging on the chimney in Fig. 7, this is done through the end and the iron is skimmed through the same opening. The chimney being located as it is at one side of the end, allows the charging to be done very easily.

The bungs are altogether different in the construction of their ironwork for each of the two furnaces. The bungs to the one first described consist of a cast-iron arch with a bolt running through it holding two plates, one at each end, which drop down below the end of cast-iron and are drawn toward the center, in this way pinching in and holding the brick; enough key brick being put in among the straight ones to form the proper circle for arch. In the construction of the bungs, seen in Fig. 5, there are simply the two end pieces and two stiff rods with nut inside and outside, as seen at N N end bung, Figs. 4 and 5. In this way the nuts can be tightened to suit. Of course these are small bungs, while the first are certainly much larger and have to be handled by a hoist; but judging by what I have seen of the two styles, I think larger ones constructed on the same principle as those shown in Figs. 4 and 5 will give better satisfaction. Fig. 6 will give an idea of how

FIG. 7

NATURAL DRAFT REVERBERATORY FURNACE.

bungs for the first furnace are constructed.

In firing the furnaces it is supposed there will be kept about four inches of coal on the grates, as experience teaches the best results are obtained with that amount, or a trifle above it. To regulate the draft, some furnaces have a damper at top of stack, but on these shown none are used.

I have been informed that some furnaces have been built where the blast besides being introduced to the fire box is also admitted through from four to six small tuyeres in the roof of the furnace, located just back of the bridge wall. The idea being to deflect the flame on to the iron and that very satisfactory results have been obtained, but the ash pit was open, and the fire was fed as it were by natural draft while the introduction of blast at points stated, deflected the flame and gave a better or increased draft.

An Inquiry from the North.

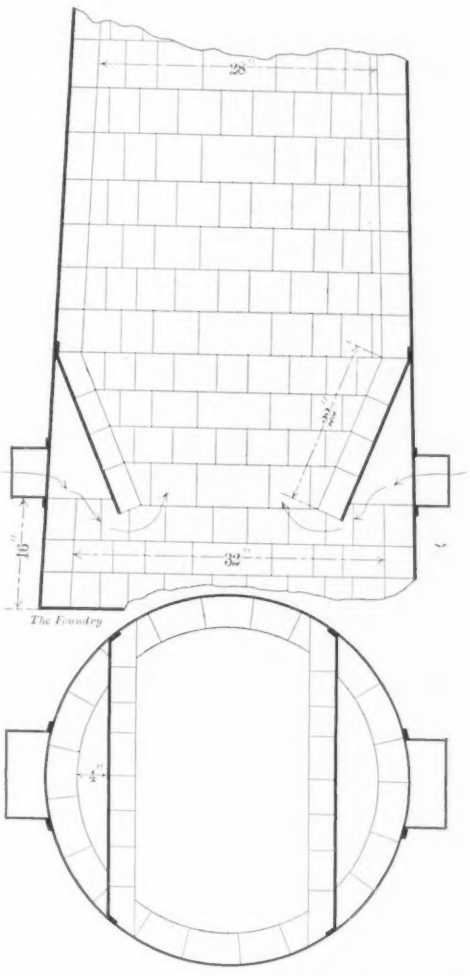
The shop that has every facility good management can suggest together with an abundant supply of the right materials can hardly realize what it means to be called upon to produce castings in a territory where nature has been less provident and where high freight rates make what we consider necessities appear like luxuries.

We recently received a communication from Woodside Bros., of the Port Arthur Iron Works, Port Arthur, Ontario, in which they ask the following questions, which we will thank some of our readers to take up:

We would like to receive through your paper some hints as to how foundries situated similarly to ourselves utilize such native sands as are found in their vicinity. We have been using Wellington and Albany molding sands in the past, but as these brands cost us in the neighborhood of $7 per ton it is precious dirt. We find that our native sand is a little weak in bond and liable to cut where the iron runs across the face of the mold in pouring. We have thought that some of your inland molders may have had the same experience as ourselves and we should like to know how they treat such sands so that they are suitable for a variety of castings, heavy and light, from stoves to stamp mill castings, etc.

Is Ferro-Silicon in general use among your foundries? We have been advised to use it in order to have our mixture carry a larger percentage of scrap iron.

We hand you a sketch of a small cupola that recently came to our notice. There is what may be called an apron fastened to the



CUPOLA WITH NOVEL TUYERE ARRANGEMENT.

shell in opposite sides and these lined with firebrick are supposed to throw the blast downwards. Would there be any advantages gained by this form of construction?

Getting a Start.

At Al. Stevens' new foundry the sand and flasks will be fitted for business this week. The cupola and runways are up and ready for business. The shafting, blower and emery wheels are being put in. C. A. Thorpe's traction engine will be used for the present to furnish power.—Sioux City (Ia.) Sun.

The Pig Iron Syndicate System of Germany, The Pig Iron Warrant System of Great Britain, and the Method of Selling Pig Iron in the United States.*

WITH COMMENTS UPON EACH.

BY GEORGE H. HULL.

In considering the methods of conducting the pig iron business in the three most important iron producing countries, it might be well to first review the nature of this business in the United States, that we may better judge of what particular system will meet the exact demands of the business in this country.

Each decade in the history of pig iron consumption in the United States marks an enormous increase. This increase does not come with regularity; on the contrary, it presents a succession of long periods, covering several years, when the consumption remains about the same, with prices ruling so low that many furnaces are forced out of blast and into the hands of the sheriff. This is followed by short periods of a few months, when the consumption increases from fifty to one hundred per cent. In these seasons of great consumptive activity, it is impossible to increase the output to meet the demands. There is a famine in all iron and steel products, which causes expensive delays in important enterprises. Prices advance to enormous figures; many concerns which have large contracts and small stocks, find themselves actually paying more for their raw material than they are to get for the finished product. They hardly get their business shaped up to meet the new conditions, before prices go tumbling down again, spreading loss and disaster on every side, to be followed by another long period of depression.

Iron is so thoroughly the basis of all industries, that what affects it, must affect all manufacturing business.

The question, therefore, which most concerns every consumer of pig iron, is, what system will insure the greatest regularity in supply, with most stability in price?

An ideal system to fit such conditions, would be the existence of some group of individuals, with vast wealth, who would come forward and buy from the producers, for cash, at fair prices, all the surplus iron made during the several years of small consumption, and then in turn, during the recurring seasons of great manufacturing activity, resell it to the consumers.

Which system most nearly resembles this ideal?

GERMAN SYNDICATE SYSTEM.

The pig iron business of Germany is conducted by a syndicate or association of the individual producers. The leading idea of its organizers was to do away with needless and ruinous competition among themselves. At the time of its formation, it was made quite clear, that the organization did not wish, or intend, to enhance prices to the consumers in an oppressive way.

At the beginning, each member was required to file a statement of his or their production for a number of years, and the average annual production of each, as thus shown, was made the basis of the percentage of production allowed to each company from time to time. When the demand for iron falls off, the total production of the furnaces is cut down accordingly; when the demand increases, the total production, as far as the capacity of the furnaces permits, is increased to conform to the greater demand. As it is not always practical for each company to cut down production to meet the arbitrary percentage ordered, the difficulty is met by a payment, by the syndicate, to the furnace company which makes less than its allotment, and by a corresponding collection from the furnace company, which makes more than its allotment.

In order to keep the respective parties to their agreements, each individual or company, on being admitted to membership, is required to deposit with the syndicate bank, an accepted sight bill for a certain amount, with the condition that said sight bill is to be forfeited to the syndicate, if the conditions of the agreement are violated by the member depositing it.

The syndicate has one office. All inquiries for iron from consumers and dealers must be addressed to this office, and no member is allowed to sell, except through this channel. The syndicate purchases all supplies for its members; it fixes the price for the different qualities of iron from time to time; it will sell for delivery six or twelve months ahead, or longer, to meet special requirements.

The system has resulted in a large reduction in the expense of selling iron, and in a

*Presented at the February meeting of the Foundrymen's Association.

very considerable saving in the purchasing of supplies. It has entirely done away with ruinous competition, and has maintained prices which have been fairly remunerative to the producers.

There are objections to the system. It puts all the power in the hands of the producers, a power which is at any time liable to be abused. It is artificial. It is not the result of free and untrammeled operation of natural laws. It is a forced condition, held together by an agreement which is maintained by the fear of forfeits and penalties.

History does not furnish a single example of any business system, formed and maintained by such methods, which has endured. The serious defect of the system lies in the fact that it not only lacks a method of accumulating and carrying a reserve stock in dull times, but its chief object is to prevent such an accumulation.

A system which restricts the production of the article most necessary to the growth of the country in wealth and power, is arrayed against the public good, and should be prohibited by national law.

BRITISH WARRANT SYSTEM.

The British Warrant System originated in Scotland about the year 1840, though no statistics of same have been preserved farther back than 1845. Briefly stated, the warrant system is to the pig iron business, what the elevator system is to the grain business, and what the public warehouse system is to the cotton business.

The functions of a warrant company are few and simple; it receives into its yards pig iron, which it has previously weighed, inspected and classified, and for which it gives to the owner of the iron a warrant. This warrant is simply a negotiable warehouse receipt, which describes the brand, quality, and weight of the iron it represents, and guarantees or warrants, that on return of the warrant duly endorsed, and payment of storage, it will deliver the iron it describes, free on board cars, to the party presenting said document.

A warrant company performs no other acts or functions, but the effect of these acts, is to create a document, which the furnace company can sell for cash, and which can be transferred by sale, any number of times, each purchaser becoming the owner of the iron, by the transfer of the document, each purchaser having the right to re-sell the warrant, or to cancel it and obtain the iron for export, consumption, or any other desired purpose.

At first, the Scotch warrant consisted of scrip, or storage receipts, issued by the pig iron makers, for the convenience of dealers, but so many irregularities occurred, that it was found necessary to have the iron stored in the yards of an independent firm of undoubted standing. The firm of Connal & Co., now Connal & Co., Limited, inaugurated the system of issuing the present "Storekeeper's Warrant."

For fifty years these warrants have been regarded as an absolute security; money is loaned upon them with confidence by every bank in the kingdom, the prevailing rate of interest being one-half of one per cent per annum above the Bank of England rates, which is a rate enjoyed only by the most favored collateral. The semi-daily dealings in these warrants is the prominent feature on the floor of the Royal Exchange of Glasgow. The warrants are bought and sold, not only by the iron producer, consumer, and merchant, but by the general public; it is, in fact, the favorite security among all classes who buy and sell for a profit, and the dealings in consequence are enormous; there are more than seventy members of the Exchange who make a specialty of buying and selling warrants for the public.

The wheat certificate is the only security in the United States, which in popularity, approaches the popularity of the pig iron warrant in Great Britain.

The statistics of the Scotch warrant system show that the average reserve stock of iron carried by that method during the last fifty years, has been more than six months' production; for one period of five years, it was more than twelve months' production. There have been six periods of accumulation and six periods of depletion of stock, and three times these large reserve stocks have been reduced to less than 100,000 tons. This is evidence that the seasons of accumulation were not seasons of over-production, since each accumulation was afterwards almost entirely exhausted by the legitimate business demands of the country.

It is no more over-production to make and store up enough iron in seven years of dullness, to supply the business of the country through two years of activity, than it is to raise and store up in a few weeks of harvest, enough grain to supply the country during twelve months of consumption; it

simply requires a broader mind to take in the proposition.

Great Britain has been the country to which for a century, all the world has looked for everything connected with iron. An English contractor will undertake a contract in a foreign country, which requires 50,000 tons of iron and five years to complete, as readily as an American contractor will take one which can be completed in a few months, simply because he can protect himself against fluctuations in price of iron and steel, through the warrant system. When such a contract is taken by the English contractor, he immediately closes a contract with his exchange dealer for warrants covering 50,000 tons, at the market price, which the dealer agrees to carry at two cents per ton per month storage and a low rate of interest, perhaps one and one-half per cent per annum. It may be a year before the contractor is ready to give an order for the first 10,000 tons of steel to be used in his work; when he gives the order, he sells an equal tonnage of his warrants. If the price of steel has advanced, the warrant iron has advanced; if iron has declined, he buys his steel at a corresponding decline; he is thus protected on each order he places for steel during the five years. By this means he eliminates all risk of fluctuations and confines his business to its legitimate profits.

The warrant system has no disadvantages, and no just argument can be made against it. There is no good thing, however, which cannot be misused. Some people have tried to corner the warrant market, and, as usual, been badly crippled in the attempt. These victims of their own folly have made an outcry against it, and made an effort to have the system abolished by Parliament. They were like the few frogs in the pond, which made so much noise it was thought there were a million, but when the round-up took place, they discovered the three loneliest men who ever arrayed themselves against a nation. It would be just as reasonable to ask Parliament to abolish razors, because a few people have been known to cut their throats with them. The effect of these corners upon those who were engaged in the legitimate business of producing, consuming or dealing was simply to give them an opportunity of unloading all their surplus on the ring, at high prices, while the corner lasted, to be bought back the next month at a handsome profit.

The legitimate price of a staple must and always will assert itself, by and through the actual business doing in that staple. Speculative interference has had, and can have, only a temporary influence.

An argument used against the system by some of its opponents, is that it creates a collateral on which producers can easily borrow money from banks, and that parties have sometimes so borrowed, and have increased and continued so borrowing on their product until they were ruined.

This argument is characterized by such intellectual depth and penetration, that the only remedy we can suggest is that Parliament be asked to abolish banks at the same time it does razors. It is of course a folly for any producer to pile up his product, and carry it for several years with interest and storage charges accumulating against it, for unless it advances enormously at the end, it is likely to terminate disastrously. The dealer, however, under modern exchange methods, may carry iron under these conditions, and make a handsome annual profit in so doing.

The opinions of prominent men in England and Scotland who have been identified with the iron business for a generation, can be summarized as follows:

The warrant system works beneficially in every respect, to both the producer and consumer. Through it the maker, even in dull times, finds a ready market for that portion of his product which is not taken promptly by the consumer or dealer. Through it the consumer is brought, in effect, face to face with every seller, be he producer, dealer or investor, and is thus able to buy to the best possible advantage. The producer who anticipates a decline, may sell his product for months or years ahead, take out warrants for it as made, and collect cash for his warrants as presented. The consumer, if he anticipates an advance, may provide for his requirements for months or years ahead, with certainty that the iron will be delivered to him immediately on presentation of his warrant. It has all the advantages of the syndicate system, without its disadvantages, and at the same time, allows free scope to individual opinion and enterprise.

It is in fact a balance-wheel to the whole trade.

The system is not forced or artificial. It is of natural growth, built up by the free and untrammeled working of all the elements,

through an experience of centuries. Neither party controls it. It does not tie the hands of any element. It is not maintained by any agreements which must be held together by forfeits and penalties. It has nurtured a body of strong, vigorous, self-sustaining producers and consumers. Its existence and growth has depended on its usefulness to the producer and consumer alike, and its continued existence for sixty years without change, while constant changes have taken place in the systems of other countries, is the best evidence that it meets the requirements of all the interests connected with the iron business.

Above all, it is an effective means, and the only means, through which large reserve stocks can be accumulated, without depressing prices. It is, in short, a working out, on sound and natural business principles, of the "ideal system" pictured in the opening of this paper.

AMERICAN METHOD OF SELLING IRON.

The pig iron business of the United States has been of such sudden growth, that it has not had time to crystallize into a system. The methods of to-day are simply what changing conditions and necessities have made them. In 1840 the total production was but 280,000 tons; at that time the iron was sold by furnace companies. Twenty years later it had only increased to 820,000 tons and was still sold largely by the producer, but in the interim, through various causes, such as needy producers being obliged in dull times to pledge their iron for advances in money or supplies, the trade in the large cities had drifted partly into the hands of wholesale dealers in merchandise. The iron so pledged was first shipped from the furnace to the merchant, who hauled to yard and stored it, which necessitated a second hauling and shipment when it was finally sold to the consumers. This double handling added greatly to the expense, and the merchant having other business, gave only incidental attention to selling iron. The selling business being only half done, was poorly done.

Later on, the merchant's portion of the business went over to commission men, in consequence of the latter being able to give their whole attention to selling, but it was not until the commission agents abandoned the system of double handling, and inaugurated the system of making sales, to be filled by shipment directly from the furnace to the consumer, that the makers gave up selling it themselves, and turned the business over entirely to the commission agents. When this method became general, the makers had agents in each important distributing center, and confined these agents to the territory most easily reached from such center. The number of agents was small and each one represented several different brands. Under this method the competition was greatly reduced, and was much less destructive to profits than when the makers sold part of their own output. There were at this period some 600 producers, and yet the competition was confined to from two to half a dozen agents in each territory.

Later on, when the agents became stronger financially, and were able to aid their principals, these stronger concerns secured exclusive agencies, with authority to sell in all territories; this increased the competition greatly, as each territory was invaded by the agents from several other territories; the agents were compelled to employ many traveling salesmen in order to cover the larger fields, thus their own expenses were increased to such a degree, that their business yielded but little profit. This has resulted in the agents taking on other staples, such as coal, coke and the manufactured products of iron and steel, and more recently in becoming buyers and sellers on their own account, as well as becoming interested as producers.

In some important markets, like Pittsburg, the iron commission agents have already disappeared and been replaced by the dealers.

By these changes, the American methods ar gradually working more nearly to the British system, under which the iron is handled principally by dealers, and it is a notable fact that the largest increase in business among iron sellers in this country has been with those who have been the largest buyers of warrants and iron on their own account; the fact of having something of their own, on which they could make instant quotation, giving them a great advantage over those who must consult a principal. A business must have some independence to insure its growth and permanence; the commission iron business, which is necessarily dependent on both buyers and sellers, has no independence, and is always hampered.

During all these changes in the American methods, many efforts have been made to

form associations in the United States, similar to the German Syndicate System, but what has been practical in a country of 212,000 square miles, where the interests of all producers were similar, has been impossible in a country of 3,600,000 square miles, where the interests of the producers were so conflicting and varied.

At the present time such associations or syndicates are prohibited by United States law.

Thus for sixty years, through constant changes, the American producer has been struggling for some satisfactory method of marketing his product, and if, during that sixty years, there has been one producer or one consumer who has been satisfied with the methods in vogue, he has failed to make himself known to the world.

We hear of furnace companies building works to consume their product, because they cannot sell it to advantage, and we hear of consumers building furnaces to make their pig iron because they cannot buy to advantage, but we hear of no one who is satisfied with conditions as they are.

The methods in vogue have given to the American iron business only the experience of constant suffering; seven years when the makers are suffering for buyers, and two years when the consumers are suffering for sellers.

During all this time the iron business of Great Britain has been conducted under one system, and during ten years of correspondence with, and a month spent among the iron men of that country, we have never encountered one, who did not consider their system a benefit to both producers and consumers.

Next to good government, there is nothing so important to the business welfare of any progressive nation, as an ample supply of iron and stability in its price.

Any condition which causes an advance of 100 per cent in the price of any important staple, is an evil; such an advance in the price of pig iron, the staple on which our country most depends for its growth in wealth and power, is a calamity. All other things advance in sympathy, until they reach a figure which every thinking man knows cannot last; the greater the advance, the greater must be the decline, and the more disastrous must be the depression which follows.

Does anyone believe that the advances in all commodities would have reached the present enormous figures, if the advances in iron during the last twelve months had been confined to 10 or 15 per cent?

Keep the price of iron within reasonable bounds and you keep everything within bounds.

Let us have investors, dealers and speculators to buy the surplus in dull times, and it will rarely, if ever, go as low as cost again.

Let us have the reserve stock which these added elements will accumulate, to supply us in active times, and it will never again go up to such enormous figures.

The principal argument used against the adoption of the warrant system by its opponents in this country, is that the introduction of speculation into the iron business, will increase the fluctuations in its price, and yet statistics show directly the opposite effect has attended the introduction of all other articles to exchange dealings in the United States. Let us see if this has not also been the effect upon iron in Great Britain.

To answer this question we will take the official quotations of pig iron on the Glasgow Exchange, the birthplace and home of the warrant system, in contrast with the official quotations of the Cincinnati Chamber of Commerce, which most nearly represents the average price in this country, which had no warrant system during the period covered by the comparison.

When the price of iron reached $50 per ton in Cincinnati in 1854, it represented an advance of 163 per cent, the advance in Glasgow at the same time was 45 per cent. When iron reached $80 per ton in Cincinnati in 1864, it represented an advance of 344 per cent, the advance in Glasgow at the same time was 37 per cent. When iron advanced to $59 in Cincinnati in 1872, it advanced to but $34.50 in Glasgow. When iron reached $44 in Cincinnati in 1880, it represented an advance of 125 per cent, the advance in Glasgow at the same time was 60 per cent.

The main argument against the system has therefore no foundation to stand upon.

With the great advantages afforded by the British system, and the disadvantages caused by our want of system, it may seem strange that the warrant system was not adopted in this country forty years ago, but every business, like every individual, must go through a period of development, and this takes time and experience. It is no more possible for a small or new business to adopt mature

methods of administration, than it is for a youth to assume the mature manners of the adult.

The iron business of Great Britain is several hundred years old; it was a strong, vigorous adult when the iron business of America was a puny infant. The methods in vogue for the last fifty years in the iron business of America had been tried and were discarded by Great Britain more than half a century ago. The exchange system is simply the final refuge of each business as it expands and discards old and inadequate methods. It is in effect, simply creating a negotiable paper representative of the article to be dealt in, and then bringing, at a given time and place, everyone who wishes to buy, face to face with everyone who wishes to sell that article.

Human ingenuity has not yet discovered a method more nearly perfect for controlling a business of great magnitude.

Every business which reaches great magnitude necessarily comes to the warehouse and exchange system. It is the only method which has stood the test of time, and which is surely adopted after all other experiments have failed and been abandoned. The plan of accumulating stocks in time of plenty, instead of slaughtering them, has been taken advantage of by dealers in almost everything except pig iron. Only a few years ago there were seasons when the receipts of fruit in the city of New York were sometimes so great within a few days, and the prices were forced so low, that the fruit hardly brought the amount of freight; this in turn discouraged shipments and then would succeed a season of great scarcity. It took experience and many years of loss to rectify this condition, but finally it resulted in the establishment of fruit exchanges and storage warehouses, where fruits were kept at a temperature just above the freezing point, where chemical change ceased, and thus it was preserved in a perfect condition for months.

The result is that prices are now more stable, the public is better served, and the profits of both producers and dealers are more uniform and remunerative. Thus, after many generations of waste, we have finally developed a fruit system. It does not limit production of fruit, and no matter how much arrives in a short time, only what the market will naturally take is offered, and the remainder goes to build up a reserve supply. So we find vegetables, eggs, butter, fish and poultry, as well as grain, cotton, provisions, coffee and many other articles, getting the benefit of a system, while iron is still left to drift in a haphazard way.

The American Warrant System has made a small beginning, but it has demonstrated the fact that it constantly absorbs surplus iron during the dull periods, and steadily gives up this stock when the country most needs it.

But warrant yards are only part of the warrant system; to make it complete, there must be daily exchange dealings of such magnitude, that buying and selling orders can always be promptly executed.

The system has been a benefit to those who have given it a fair trial. It has in many instances been the only channel through which needy furnace companies have been able to get money in times of great stringency, and has saved them from being obliged to blow out or bank their furnaces.

The reserve stock accumulated by this system, although small, has furnished the iron to tide over many a manufacturing concern during the last year, which, without it, must have suspended work at times when it would have caused them loss and great inconvenience.

It has been of the most pronounced benefit to such dealers as were the first to take hold of it. The growth of their business has been almost in exact proportion as they have dealt in warrants, not only in the domestic, but in the export business. In fact, no one appears to have made a success in the export business except those who have dealt in warrants.

For more than a century the commercial world has looked first to Great Britain for everything connected with iron. With her lower cost and large reserve stock, she has been able to maintain a stability in prices and supply, which has enabled her to control the markets of the world. The United States has for several years been the cheapest iron producing country in the world, and should have begun making large exports of iron long before she did, but for ten years her reserve stock has been less than twenty-three days' consumption. If we are in the future to have uninterrupted control of the iron markets of the world, we must carry enough stock to

give stability to prices. The higher cost and reduced product of Great Britain has prevented her accumulating her usual reserve during the last few years, and will prevent this in future. The world's reserve supply in the future must be accumulated in the United States. The introduction of the Warrant System in this country, has, therefore, been most timely.

British dealers have for eight years been among the largest holders of American warrants, and the introduction of them to exchanges in Great Britain is already under discussion. If dealings in American Warrants become centered in London or Glasgow, instead of New York, British dealers will still control the iron markets of the world, even after the principal supply comes from this country.

Since the dawn of civilization, the importance of storing up stocks of such things as were necessary to the life, defense and well being of man, has been recognized by all nations and people. The Scriptures, from Genesis to Revelation, abound in accounts of the immense store houses and store cities builded and maintained by the great nations of ancient times. They not only gathered in the months of harvest, sufficient to supply the people until the next harvest, but they stored up in years of plenty, sufficient to provide for the years of famine. This wise provision ranked first in importance in all temporal affairs.

Technical Blunders—Journalistic Humor on Foundry Matters.

BY JAS. MURPHY.

The condensed wit of all the comic papers in the country would not make a molder laugh half so hearty as a piece of ordinary newspaper architecture on foundry work written up for an enterprising paper by a reporter who in all probability had discarded his "swayback" farmer life to become a future Horace Greely on some great metropolitan newspaper. His chief attainment is an academic education, his cheek and his "nose for news." The "nose for news" is a prominent factor in maintaining a livelihood, but of little use if the scent is not keen, and without a technical education that boasted of "nose for news" invariably leads its owner on the wrong side of the scent, particularly so when nosing after foundry matters.

I here append an article from the Elizabeth Daily Leader, which is characteristic of the nimble pencil and pliable nature of the reporters of this New Jersey, Chelsea:

BUSY SCENES AT MOORE'S.

Great Ten Ton Casting Successfully Made Yesterday Afternoon.

While walking along First Street yesterday afternoon "nosing out news" a Daily Leader reporter was attracted by evidences of activity in the foundry of the Crescent Iron Works and stopped to inquire its cause. A great iron sewer connection weighing in the neighborhood of ten tons was about to be cast and the operation was a most interesting one to witness.

The mould has been in process of preparation for over a week and is a solid brick and concrete structure fifteen feet high and about seven in diameter. It looks as if it was built to withstand the wear and tear of centuries and not to be knocked to pieces in a few days. While the finishing touches are being put on the mould, other workmen are preparing the different artificial river beds along which the molten metal is to run into the various openings of the structure. When all is ready, the word is givn and with a blinding glare, lighting up the semi-darkness with a brilliant red the jaws of the great furnace open and a golden fiery stream of molten iron issues from them. The burning river divides a few feet from its head and becomes three separate streams of hissing heat and flame.

The scene at this stage is one of intense interest and if it could be reproduced on canvas by some great painter would be most effective. It is a little glimpse of the infernal regions, it almost seems.

The rivers run smoothly, without overflowing their banks, under the constant care of the several foremen. Should anything happen to the ducts and the metal run over the ground, the most awful death and maiming would follow. In twenty minutes exactly the head man reports the mould full, the living streams die and the room again assumes its normal appearance. The men are again men, and not demons feeding the eternal flames, the doors fly open and the glorious light of day streams into the gloomy casting room.

The molten metal will be left in the mould for three days, when the surrounding mass will be knocked away and the complete casting revealed.

Many molders keep scrap books for preserving such humorous productions as the above. It may be pardonable ignorance not to know much about the foundry business in some backwoods town in Vermont, Maine or New Hampshire, but in this mosquito ridden metropolitan suburb ten-ton castings are the daily rule and not the exception in most of the shops. In the New York Journal of

Feb. 4 appears the very important piece of news that some unknown party in Toledo, Ohio, "has successfully cast aluminum in a sand mold, a result which countless inventors all over the country have been endeavoring to reach for years," and goes on to say, "It is asserted that this will revolutionize the manufacture of articles of this now important metal as it will greatly reduce the cost of manufacturing. * * * A factory will be built here. The name of the inventor is not made known and will not be until the arrangements for the new plant are effected." It sounds queer that casting aluminum in sand molds has just been invented. Methinks some cad cajoled a reporter after the manner of Lord Poussuwynd, of London, England. I am aware that for some years unions of aluminum molders have existed, and I am perfectly sure that I cast aluminum in sand molds two years ago. Some technical publications are not at all free from error of detail when dealing with the foundry business. In the American Machinist of Feb. 1, in the course of an otherwise well written article descriptive of the Walker & Pratt Stove Shop, of Watertown, Mass., says, "All the sand used each day is returned to the sand storage house where it is dried over large coils of steam pipe and run through very fine screens before it is used again."

The shop itself is without doubt the most modern thing in the foundry line that I ever had the privilege of examining and I was a visitor at that shop on one occasion and was well received and shown over the premises. I am perfectly sure, however, that, though modern it is, all the sand that is on the floors of from 60 to 80 molders is not removed at night after casting time to be dried and entirely new sand heap put on each man's floor in the morning. The Walker & Pratt Co. are as much business people as any other in the business and the "stove platers" work as hard as elsewhere, dump their own work, pull out their castings, cut their own sand and wet it to their own liking, as the process of casting dry it enough without the aid of steam pipes. They also work half naked, jump like grasshoppers ramming flasks—with their feet—eat their dinner out of one hand and mold and shake the blacking bag with the other, and work on the piece work system. With the exception of splendid light, a clean, well regulated shop and exquisite toilet arrangements, there is little difference between the modus operandi of that shop and any other in the stove and range manufacture.

Setting Strickles for Loam Work.

BY GEORGE BUCHANAN.

Much time and trouble is often caused in setting strickles, say for cylinder copes, especially when a heavy strickle has to be set on a loam flange, which is of course very tender. The following method will be found simple and easy to work, setting both seating and cope strickles in one operation. The strickle which strikes cope or body of cylinder has attached to its base strickle

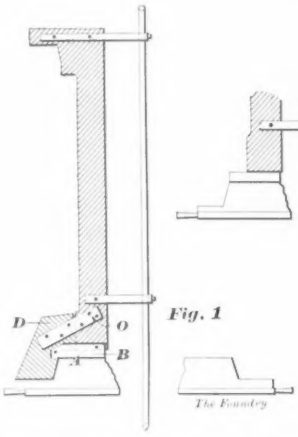


Fig. 1

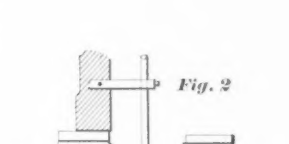


Fig. 2

for flange and seat as shown in Fig. 1. The board or strickle having been set, a suitable height for bricking the face, A is finished off, the strip marked B is then unscrewed and flange struck up and the whole is then finished off; the piece D is next removed by taking out screws marked O; the cope strickle will then be found to be correctly set, as shown in Fig. 2.

Monkeying with the Buzz Saw.

Workmen at the Spencer's foundry, yesterday morning, endeavored to cool a mass of coal and iron which had been dumped from the furnace the night before by pouring a pail of water on it. The result was an explosion which shook the entire establishment. George B. Spencer, the superintendent, received slight cuts and bruises, but no other damage was done.—New Haven (Conn.) Leader.

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The Detroit News Co. will supply the trade with THE FOUNDRY, through the regular channels of the American News Co.

We want to obtain examples of current foundry practice. Photographs, drawings and descriptive matter, showing just what is being accomplished in the foundries of to-day, will be cheerfully paid for.

We can not furnish a continuous set of back numbers beyond August, 1899.

Entered at the Post Office at Detroit, Mich., as second-class matter.

Trade Outlook.

Probably no better indication to the views held by foundrymen in general could be afforded than the answers obtained by Messrs. Rogers, Brown & Co. in a recent canvass among prominent consumers of pig iron.

On the question, how long they believed the current volume of business would continue, basing their opinion on present contracts and prospective orders, there were 883 reports; 232 reported that business would continue six months; 345 that it would continue 12 months, based on contracts in hand and in prospect; 42 expected indefinite continuance of present activity; 35 answered, "About the same as now;" 8 reported, "Will not continue;" 2, "Will continue if prices of iron are reduced." The remaining answers were scattering as to the time, the estimates ranging from 2 months to 10.

On the question as to percentage of melt as compared with last year, 293 out of 890 estimated same as 1899; 114 estimated 10 per cent increase; 103, 20 per cent increase; 123, 25 per cent increase; 63, 50 per cent increase; 12, 75 per cent increase, and 25, 100 per cent increase. The other replies were scattering, averages ranging between 15 and 90 per cent.

On the point, how long the supply on hand would last, there were 898 reports—46 would be out of iron in February, 78 in March, 102 in April, 86 in May, 80 in June, 255 in July, 73 in August, 59 in September, 34 in October, 17 in November, 10 in December, and 49 were covered to January 1, 1901.

In a recent report Rogers, Brown & Co. note that there has been extreme urgency on the part of consumers to have iron sent forward on existing contracts. The furnace companies are more occupied now in trying to satisfy those to whom iron was sold months ago than in attempting to get new contracts. The output of furnaces on foundry iron has in general been very disappointing. Many of them have been unable to get a sufficient supply of fuel, and have either been blowing light, or have been obliged to bank temporarily. The consequence is that the output has been irregular, ranging from high silicon to mottled grades, without a due proportion of Nos. 1 and 2 foundry and soft irons. The coke companies which have a surplus of furnace coke to sell have been pushing up prices, and the margin of profits for iron producers is nowhere near the figure that is generally supposed. The impression seems to be gaining ground among buyers that it is not reasonable to expect a decline in prices during the continuance of present conditions, and some of those who have been testing the market have purchased round lots for scattered delivery at best quotations obtainable. The No. 2 foundry is especially scarce, and those wishing to buy basic iron find that there are frequently no sellers who would guarantee stated deliveries. Those who have been counting on the furnaces recently started in the South producing iron sufficient to relieve the situation have been disappointed, because the output is small and irregular. The car companies and malleable concerns are greatly inconvenienced by the inability of furnaces to ship promptly, and the output of some of them is curtailed in consequence. There is a disposition still manifest on the part of many buyers to stay out of the market as long as they can, and if, as usually happens, they come on to cover

their requirements at about the same time, there is a possibility that the demand will push quotations higher, at least temporarily.

Among the Flux Fakirs.

The mainsprings of some individuals appear to be more or less out of order. There is an inborn desire upon the part of many to accumulate wealth faster than can be accomplished through ordinary channels and when some schemer agrees to double their money in a year's time they fall over each other to hand over their belongings. This has been demonstrated by several failures of investment companies lately, yet if similar institutions were started to-morrow, and the postal authorities would keep their hands off the proceedings, there would be found an abundant crop of otherwise intelligent people who would be ready to part with whatever cash they could command, in an effort to get rich in less time than is allowed by legitimate means.

The republic of Mexico is for the present the home of a combination of flux fakirs operating under the name of the National Ore & Reduction Co., and the foundrymen of the country are receiving large quantities of circulars bearing a Mexican postage stamp. As the rates of postage between the United States and Mexico are no higher than the domestic rates it follows that it does not cost any more to conduct a swindle from the country across the Rio Grande than it does to operate that kind of an enterprise at home. There is the added security that legal proceedings do not hold abroad without a considerable expenditure of wind-jamming before the state department.

There is an old saying that it is cheaper to move than to pay rent and putting this principle to a test is evidently what makes the National Ore & Reduction Company locate its main office and works (?) in the land of the peon. This concern is not satisfied with the amount of people it can bunco under its own color but persists in using the names of reliable concerns, as their representatives, without their consent. This stamps its transactions as fraudulent from the start. Several journals, whose editors could not tell the difference between a gagger and a fin, have aided the flux fakirs by publishing their announcements and now have a lot of unpaid advertising bills to show for their trouble.

The agents for this Mexican flux, known by the appalling name of "Ferro Nickel Manganese Calcium Fluoride," are constantly changing. The latest victim that has come to our notice is a Mr. F. Ingold, of 109 California street, San Francisco. This young man should not be allowed to go away from home without telling his mother of his whereabouts. Anyone that allows himself to have anything to do with the National Ore & Reduction Company is mentally unbalanced and should be taken care of.

Those connected with the reduction company are evidently becoming in need of a little ready change to pay their laundry bills as the following circular shows them to be having a bargain sale:

AN INVESTMENT THAT WILL PAY.

We Want Capable Men to Act as Managers and Employ Sub-Agents to advertise our product and Make from $1,000 to $3,000 per Month every month in the year.

A CHANCE TO MAKE MONEY

like this does not occur often in a life time, and to have an article that is in universal demand, that is entirely new, nothing like it on the market, no competition, no other product to be brought against it, is a chance that means money to every man who takes hold of the business.

NICKEL MANGANESE CALCIUM FLUORIDE

Can be ordered as follows:
In 100 pound lots.....12 cts. per lb.
In 300 pound lots.....10 cts. per lb.

ABOUT TERRITORY.

We must have assurance that our agents are in earnest and that they are not triflers or simply curiosity seekers, or men without ability or character. We must have agents who will put our product before the Foundrymen in a proper manner.

All the advertising necessary is to deliver a pound package to each foundry, and one trial secures the customer for all time.

If the business interests you do not delay, but write us at once sending cash for 300 pounds, less a rebate of 25 per cent; send $15.00 by registered letter, and we will do the rest. This offer good for 30 days only.

If you have not much money in sight we would say do not be discouraged, but get some of your friends to help you, and when they see the opportunity presented to get into a profitable and responsible business, they should be willing to do so. All you want is a little money for your first order. After that your income will double.

As manufacturers we believe that the men in the field should have an equal share of the profits with ourselves.

SPECIAL OFFER.—Upon receipt of one dollar U. S. currency, within ten days of this date, we will mail to any address in the U. S. or Canada, postage prepaid, Eight 1-lb. sacks. One-half pound is sufficient for a 50 lb. ladle test.

THE NATIONAL ORE & REDUCTION CO. Harvey Kline, Secy.

Durango, Mexico, Jan. 24, 1900.

There are a few slight mistakes in the wording of this circular. It states that men without character are not wanted. Of course with a salary of three thousand dollars a month most any kind of a man can be obtained, even a few people with excellent characters might be willing to hire out at this figure, but what is really needed is men without character of any kind whatsoever. The man who should undertake to deliver a second package of this flux would be sure to be shot. There is no joking about this.

If you have fifteen dollars do not invest it in removing three hundred pounds of Mexican soil to this land of the free. Give your money to the poor.

As Good as a Gold Mine—If it Works.

One of our friends sends us a clipping from a Houston, Texas, paper which leads us to believe that the sterner sex are not having a monopoly in metallurgical discoveries. We say discoveries in this instance because the word we intended to use would hardly be called polite, and besides there is no use of sounding any warning if someone does lose what ready coin he has. Any man who attempts to get something for nothing has got no reason to complain. The notice reads:

IRON INTO BRASS.

It is stated that Mrs. Dr. Balfour has sold her discovery.

The secret process which Mrs. Dr. Balfour has discovered of converting iron into brass has been sold, it is stated, for a very handsome figure. A Pittsburg manufacturing firm is named as the purchaser and the price is said to be $150,000. Mrs. Balfour made her discovery public about a year ago and it attracted much attention. She has on display at her offices in the Moore & Burnett building many samples of the transformed metal and it appears to be a very fine brass product. The process of changing the metal is, of course, the secret, but it may be stated that it is principally an electric treatment that the base metal receives. Ordinary pig iron may be used and it will come out a lump of bright, soft and very malleable brass. The expense attached to the process is said to be comparatively small, and it is figured that the brass may be made for 5 cents per pound, one-fourth of its present market price. A number of Houston gentlemen investigated Mrs. Balfour's claims shortly after she made her discovery public and were very much impressed with the value of it. Representatives of the purchasing firm were in the city some time ago and while here the first overtures for a transfer of the discovery to them was made. Mrs. Balfour is now quite ill, but upon her recovery she states that she will proceed to Pittsburg on business connected with the sale.

Here is a Chance to Theorize.

We are having a bit of trouble with our cupola, and it seems everybody from the skimmer boy to the foreman has a theory as to where the trouble lies. This brought out a discussion as regards the length of blast pipe to use. We had an expert here recently, who was supposed to have had lots of experience, and he advised us that our fan was too close to the cupola. He claimed that if we would run the air pipe once around the foundry, before entering the cupola, instead of the short pipe that we now have, it would perhaps change everything into success. We are not quite willing to adopt such suggestions on someone's recommendations, from the fact that there is such a wide difference among the wise men, as to what really is wrong. The only reason that this expert (?) could assign, was "that the air passing through the long pipes accumulates 'lectricity." This of course makes us smile, but what we want to know is whether there is any advantage to be gained from long pipes, or whether they are more inclined to be detrimental. If they are a benefit, what is the underlying principle that causes the benefit. Have any scientific tests been made on this subject, and if so, what is the result? If we need more 'lectricity, what would be the objection to connect up a small dynamo to our air-pipes? We should have stated, in the first place, that the trouble we are having, is that the iron does not come down hot enough.

P. DUNCAN & CO.

The Pratt & Letchworth Company.

American industry is generally alluded to as a young giant. But few of our magnificent manufacturing concerns can show a pedigree that runs back for more than a quarter of a century.

We think that not many of our readers are aware that the Pratt & Letchworth Co., of Buffalo, N. Y., has passed the half century mark. It was in 1848 that Samuel F. Pratt, Paschal P. Pratt and William P. Letchworth began business under the firm name of Pratt & Letchworth, for a number of years continuing business as a private corporation with some slight modifications in the personnel of its partners, Mr. Josiah Letchworth, Mr. Geo. J. Letchworth and Mr. Ogden P. Letchworth having at different times been identified as members of the company.

On January 1, 1896, the partnership expired by limitation, and the company was then reorganized as a stock company with Ogden P. Letchworth, president, Josiah Letchworth, secretary and treasurer, who together with Franklin D. Locke and Robert L. Fryer form the board of directors.

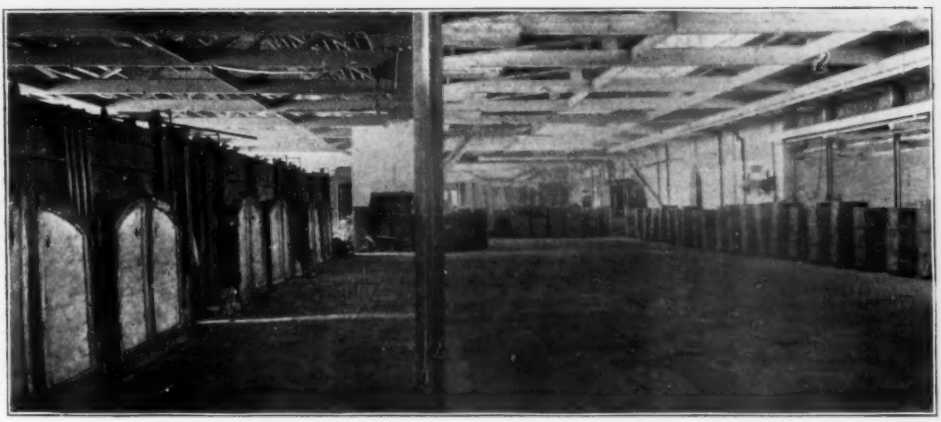
The total energy of the company is at the present time devoted to the manufacture of malleable and steel castings. At one time saddlery hardware formed a branch of their business, but this has been discontinued several years.

The entire plant of the Pratt & Letchworth Company is operated by electric power, the current being brought to Buffalo from Niagara Falls on a copper insulated wire at 2,200 volts, known as a three phase current. This is introduced through a switch-board into a fireproof room, where are located three large transformers which reduce or step the current down, from 2,200 volts to 168 volts alternating current. It is then passed through what is known as a rotary converter, which changes this alternating 168 volt current to a direct 220 volt current, and from this point is carried by

PLANT OF THE PRATT & LETCHWORTH CO., BUFFALO, N. Y.

wires to all parts of the works, where are located motors that operate various machines in different departments as the case may be. In this way are operated the electric cranes, the carpenter shop, pattern and machine shop, blowers, tumbling rooms, etc., for a late heat, power for same can be generated at what it actually meters, whereas under the former system the entire steam plant oftimes had to be kept in operation to supply a very small amount of power for some particular portion of the plant.

PORTION OF SHIPPING ROOM.



ANNEALING ROOM.

reducing the vast amount of shafting heretofore used and necessary under the old order of things in a plant of this size.

An attractive feature of this method of producing power is the fact that it can be used in different units, so that if, for instance, it is necessary to use a blower only

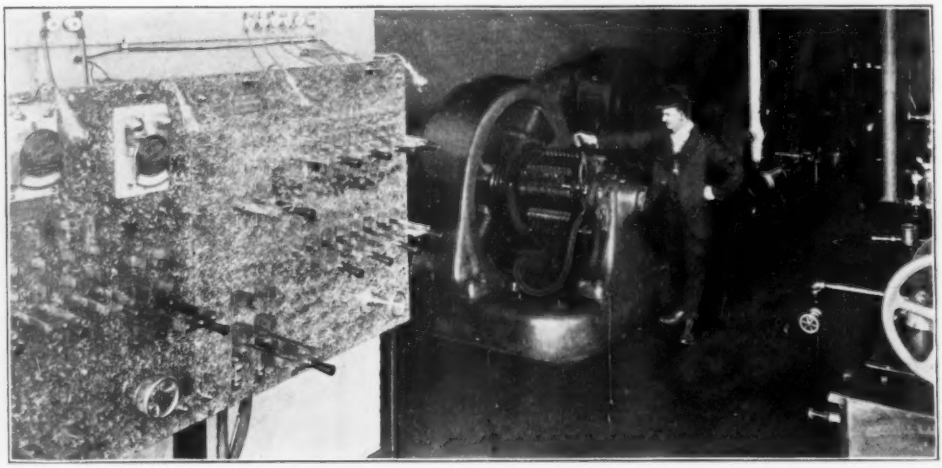
The plant of the Pratt & Letchworth Company is probably the only one of its kind which is operated by electric power throughout. The change to this power took place Dec. 30 last, and was made a special occasion, a large number of Buffalo business men and other invited guests being afforded the chance of inspecting the works.

Several of those present made speeches suitable to the occasion. Mr. W. A. Rogers referred to the natural endowments with which nature had favored Buffalo and the necessity of providing new plants with sites suitable for manufacturing purposes, and

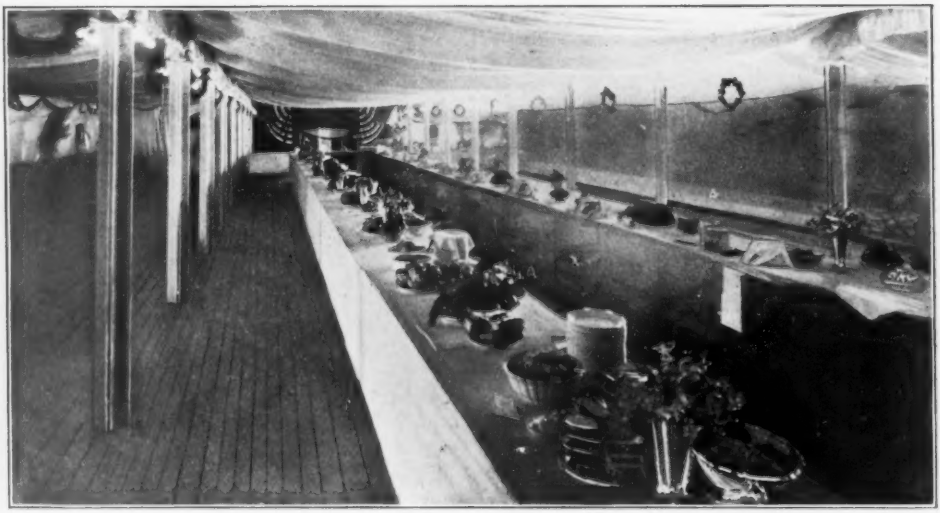
been accomplished during its incumbency.

Mr. O. P. Letchworth, referring to the adoption of electric power for operating the works, said:

"The little incident we have witnessed this morning marks a new era in the history of



CORNER OF POWER PLANT.



EMPLOYES BANQUET TABLE AS IT APPEARED NEW YEARS DAY.

the local improvements it was proposed to carry out to further this.

Mr. C. W. Goodyear dealt with the great changes that have occurred during the last few years, and referred in glowing terms to the McKinley administration and what has

this company, and therefore it has been our pleasure to ask those of you who are our friends and our neighbors to join with us in attempting, at least, in some slight degree, to celebrate an event which certainly marks and describes a period of great interest to

us all, the practical utilization of one of nature's greatest forces, which has been made possible by the ingenuity and capital of man."

The Pratt & Letchworth Company believe in treating its employees as if they had more than a passing interest in the welfare of the company. One of our illustrations shows the large room in one of the warehouses as it appeared on New Year's day when the company tendered its employees a luncheon which was afterwards followed by dancing.

The Iron Industry of Shansi, China.

Through the courtesy of the Iron and Coal Trades Review of London, England, we are enabled to present our readers with some views of the iron industry in the province of Shansi, China.

Coal is found nearly all over the province —that is to say, over an area of about 55,000 miles—and the iron ore resources and the iron industry of the same highly favored province will form the basis for this article.

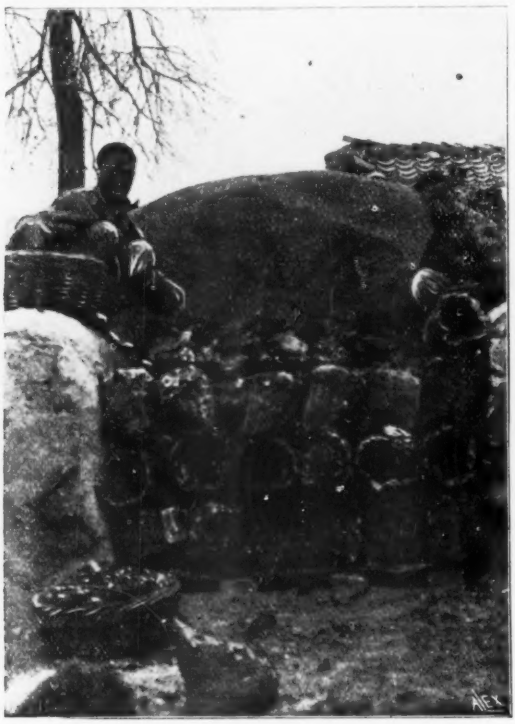
The most notable iron district is that known as Loo-ngan-fu, where the cost of cast iron is said by the chairman of the Pekin Syndicate to be only 20s. per ton, and where wrought iron, manufactured by the use of charcoal fuel, is said to be only 50s. per ton. It is of much interest to examine the extent and character of the resources that enable iron to be produced at these abnormally low prices.

The coal and iron region of Tse-chau-fu is more favorably situated in relation to the plains than any other portion of Shansi, and is said by Richthofen to have probably furnished more iron to the Chinese than any other region of similar extent in the Empire. Its vicinity to the populous plain of Hwai-

A BUDDHIST "JOSS" IN BRONZE.

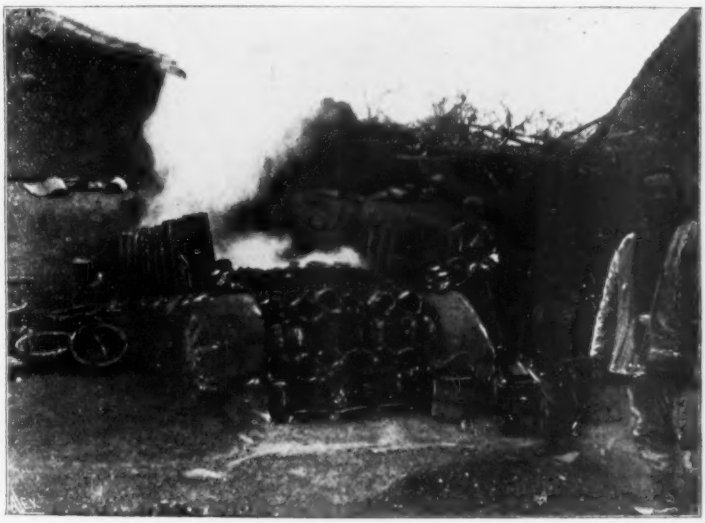
king-fu, to the Hwang-ho, to Tankow and Siu-wu-hien (the shipping places for Tientsin and the Grand Canal), and to Honan-fu, may have made it a market for the iron in old times. The occurrence of temples built by the dynasties which resided at Honan-fu, and situated near the present roads of traffic, renders it probable that the iron industry flourished here more than a thousand years ago. The same methods for getting the

YU-HSIEN IRON FURNACE, SHOWING IN FOREGROUND CRUDE IRON AS GOT FROM CRUCIBLES.



IRON FURNACE AND ATTENDANTS AT SHANSI.

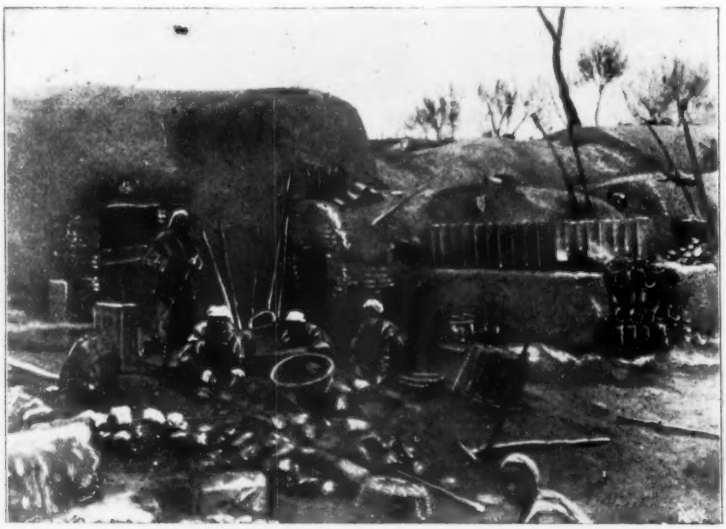
metals out of the ores were probably then applied which Richthofen witnessed. They bear the character of nearly all Chinese industry—rude, petty in the extreme, and yet remarkably perfect. If one encounters on the road incessantly trains of mules and men laden with ironware of the most varied description, one is prepared to see the metal manufactured on a somewhat large scale; and it is surprising, on arrival at the spot, to see hundreds of small establishments, between which the labor is divided, each of them manufacturing a certain set of articles, for which they may have gained a reputation.



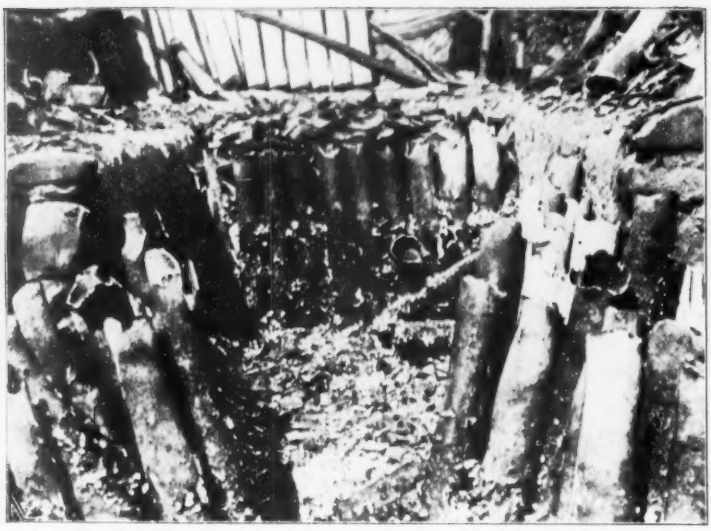
IRONWORKERS AT WORK IN SHANSI.

Iron ores occur abundantly in several strata of the coal formation. The Chinese use only one kind of ore, which melts easily without the addition of any flux. It consists of a mixture of clay iron ore and spathic ore, together with limonite and hematite, and occurs in irregular accumulations in certain limestone strata, at the bottom of the coal formation. Tai-yang-chin, 60 li northwest of Tse-chau-fu, and Kau-ping-hien are the only places where all the iron produced in the district is melted from the ores. Nothing at all approaching in appearance a European blast furnace is in use. The smelting place is an inclined plane, 8 feet long and 5 feet wide. It is enclosed on the two long sides by loam walls 4 feet hig.., the third side and the top are open, and on the fourth side it joins a small and low hut which contains the wooden bellows and the two men who pull it. The floor is covered with a layer of small pieces of anthracite. Upon this are put about 150 crucibles of fireclay, 15 inches high and 6 inches wide, containing a mixture of small pieces of anthracite with crushed iron ore. All spaces between them are carefully filled with anthracite, and another layer of pieces of this fuel put on the top. In some other regions the smelting places are 15 by 5 feet, and contain 300 crucibles. The charge is then ready for igniting. At Tai-yang, a second layer of 150 crucibles is put on the top of it; this is again covered with anthracite, and finally with a layer of old crucibles. This pile is now ignited, and air blown in. When the heat is strong enough the blast is stopped, the air which gets access through the spaces between the pieces of glowing anthracite being sufficient to keep up the temperature. Two kinds of iron are produced—one for making castings, the other for conversion into wrought iron, corresponding to our more modern foundry and forge qualities. In the former case the crucibles are taken out when the heat is strongest, and the iron poured out on a flat bottom, so as to form thin sheets. For the second purpose the pile is left to glow and cool for four days. Then the crucibles are taken out and destroyed. The iron has collected in each in a single

semi-globular piece. The pigs from Kau-ping are carried to various places in Lu-ngan-fu, those from Tai-yang to Nan-tswun, ten li west of Tse-chau-fu. For the manufacture of different articles, different mixtures of pig iron are used. The rapidly cooled flat iron in water, so as to form drops, which are very hard and brittle. It is probable that the known excellence of Shansi ironware is partly due to the application of these mixtures, in proportions which are the result of long experience, and that the particular fame



ANOTHER IRONWORKS AT LAI-YANG.



REMAINS OF IRON FURNACE AT SHANSI.

sheets are most applied. For certain articles, the slowly cooled semi-globular pieces are added in varying proportion; while for others still a third kind of pig iron is added, which appears to be produced by pouring molten

enjoyed by certain brands is owing to trifling differences in manipulation, of which certain individuals are in possession. There are other establishments at Nan-tswun for the manufacture of wrought iron, which is only

made of the semi-globular pigs. The processes used are as rude and simple in this as in the first place, and yet the material produced is of such superior quality that the Chinese prefer the Shansi wrought iron to the imported European, if the prices of both are equal. Not any steel is made in Shansi. All that is used is imported from Wuhu and Hankow. To work it up into small articles of use, Shansi iron is added to it. All manufacturing of this kind is done by single workmen, at their homes. The same is the case in regard to many other articles. At Tai-yang, for instance, a large amount of iron wire and needles is made.

Castings and wrought iron are both sold at Nan-tswun, at 20 cash per catty, or ½d per pound. Nearly all of it is carried to Ching-wha, which is the great depot. The distance to that place is 100 li.

The equipment of an iron foundry in Shansi, according to Richthofen, consists of two or three platforms on loess rising in terraces one above another, and a few excavations in the soft walls of loess, forming the sides.

Two low walls, 3 feet high, 15 feet long, and 5 feet apart, enclose the smelting place for a single layer of 300 crucibles. The top and front are open. On the fourth side is a wall of loess, in which a cave is dug for the bellows. A few of this sort of smelting places, a puddling furnace with a smoke stack consisting of a vertical pit in the loess, a cave for making crucibles, another for drying them, and a third to serve as lodgings and boarding room for a dozen or two of workmen—this is all that is required to make a foundry complete. On the highest platform the ores are smelted. The pigs are thrown down upon the second and third platforms, on one of which castings are made, while on the other the pig-iron is converted into wrought iron. A capital of $30 would be sufficient to start this complete set of foundry and iron works, including the purchase of a stock of coal, ore, and fireclay. These substances are all close at hand, and cost only a trifle. The iron ore is dug out and sold by owners of fields which happen to be situated on ore-bearing strata. An open hole is sometimes sufficient to get the best iron ore; in other places pits are sunk to little depth. Various kinds of clay and molding sand are got in a similar way. The iron is sold at 22 cash per catty (½d. per pound). Its chief depots are Hwo-lu-hien and Shun-te-fu, which in exchange, provide the mining country with grain. The works are so much scattered over the country that Richthofen was unable to make any estimate as to the quantity of iron produced.

VESTIGES OF OLD IRONWORKS IN SHANSI.

Ping-ding-chow is one of the chief centers of the iron industry of Shansi. It is not a large city: the walls are 10 li in circuit, forming a parallelogram, 3 li by 2; but there is

a very considerable population in the suburbs. In the main thoroughfare there are at least 500 shops, all of them verandahed, and more than thirty large pailows have been counted in this street alone. Some of these monuments are, however, falling to pieces, and even the elaborate carving of others would hardly save them from destruction were this a European city—they are such an obstruction to the traffic. From the great street the ground rises irregularly on either hand; within the southwest angle of the city there is a high hill, which formerly had a good wall all around its summit, making it a sort of citadel. The gateway is still in good condition, and it is approached from the town by a well-kept paved stone slope. The population of Ping-ding is said to be about twenty thousand. Coal and iron abound in the hills near. East of the city

ANOTHER CHINESE IRONWORKS.

MAKING CRUCIBLES AT YU-HSIEN.

are many coal pits worked by windlasses. The Chinese pits are usually what are known as "ingoes," i. e. simple inclined descents, like huge rabbit warrens, burrowed in the hill sides, and never very deep.

Three miles beyond are the villages of Si-kow and Toong-kow, both famous for their ironworks. But these are, after all, nothing more than very primitive pan factories, which, however, must have been wrought for many centuries, seeing that the hill sides are covered with slag. Walls, and even houses, are built of broken molds, and as these are all of one particular kind and size of pan, the effect is as though rows of cannon balls were embedded in mud. The casting goes on in the autumn and winter.

there was a good deal produced, but not to be compared to Loo-ngan-fu; that at this city you could always get as much as you wished, that it was "to to li hai," literally in "frightful lots." But besides these districts and others mentioned in Chinese books, it is believed that iron exists in many quarters not yet known to the Chinese, or, if known, not deemed by them worth working, owing to the abundance and cheapness of that already in the market. In Ping-ding-chow and Tai-yuen-fu black iron ore has been found in the bed of the mountain torrent. Traveling southward toward Ling-sz-hien iron ore has been found among the stuff at a chemical works on the wayside, and large lumps of rock, full of sulphur, etc. In the city of

IRONWORKS AT TAI-YANG.

Natives state that lime, coal, coal-charcoal, iron, and a clay they called kal (probably kaolin) are all found in the immediate neighborhood; kal is used to mix with sand for molds. Coal at Ping-ding costs 3½d. for 133 English pounds (70 cash per picul).

The Loo-ngan-fu mines produce the iron of which the chinese make their razors, knives, and cutlery. This iron is in request all over the country, and it appears to be as plentiful as it is famous. Perhaps its fame is the cause of its abundance, inducing the natives to mine it to a greater extent. An intelligent blacksmith, recently questioned on this point, said that at Tai-ping-hien and Yu-hien Ling-sz-hien, entering from the east, a walled inclosure provided with a gateway marks a place seeming to be of some notoriety. There was found a stone standing perpendicularly, carefully set in a substantial socket, having a vase for incense before it and a temple behind it. It was about 5 feet high, 3 feet wide, and 18 inches thick in the centre. It was a huge block of iron ore —in fact, nearly pure iron. The tablet at the side of it said it was found by the Emperor Sui-kai, in the tenth year of his reign, in the bed of the river Fun, which flows through the valley; that it was deemed such a curiosity by the great Emperor Kang-hi that he

ordered it to be placed in its present position, and called the name of the city "Ling-sz-hien, or the Spiritual Stone City," in honor of it.

Much of the iron produced in this province appears to be of a very superior quality. The bars of welded iron are fine in grain, and when struck ring like bells.

The price of iron in Shan-si greatly depends upon the distance from the mines, as mule hire is so expensive; but the best Loo-ngan-fu wrought-iron bars can be purchased at that city for about 3s. per cwt.

But the production of iron in the northern provinces is not confined to Shan-si. It is found in several places in Chi-li, although not so abundant. It is said to be found at Chang-li-hien, lat. 39 deg. 50 min. N., long. 119 deg. 20 min. E.; at Man-lan-a-jim, lat 40 deg. 20 min. N., long. 117 deg. 30 min. E., and at other places. It is also found outside the Great Wall, coming from the neighborhood of the Hi-fung Pass. There are also iron mines in Manchuria in juxtaposition with coal mines, 18 miles to the east of Liau-yang, lat. 41 deg. 18 min. N., long. 123 deg. 13 min. E. They supply all that district with iron utensils, and are famous all over the country.

Men and Management.

BY ELI H. PEARCE.

Molders are but human; still, I believe that their patience and temper is taxed to a greater extent than any other class of workmen that I know of. Often a molder will work all day on a mold, and then in closing it have a drop-out which may ruin his whole work; or, even if no drop-out occurs, there are a thousand and one other mishaps that may take place, and cause such blemishes as scabs, cold shuts, and other kindred eyesores.

Pattern workers, blacksmiths, machinists, and other mechanics will give us "the horse-laugh," and say: "Poor fool, go learn your trade; nothing like that ever happens to us." Just so; but then they are not molders; if they were, they would sing a different song.

I once knew a molder who was a first-class workman; in fact, he was one of the best I ever knew, and ranked the highest in the shop that he worked in. He was given a pattern to mold that required some care and attention on account of the irregular joint that it was necessary to make. Taking the pattern, he bedded it in—then making his joint; his next care was to get the flask which he had been told by the foreman was in good condition, but when examined it proved to be rather shaky for that particular job. After talking the matter over he and the foreman concluded to risk it by using gaggers and soldiers; these he placed in the flask in a sensible way, and after several hours' work the cope was hoisted off, the pattern drawn, and everything ready to close when some one looking under, shouted, "dropped." What a change of expression this spread over our molder's face. A deep sigh, and without a single word, he put on his coat and left the shop, sick at heart and generally disgusted.

The next morning he found, on his arrival at the shop, a nice new flask awaiting him. How many foremen would have treated him in this manner? A great many would have discharged him then and there. Not so with this foreman. He knew only too well that it was part of a molder's life to experience drop-outs; and instead of giving his man a severe lecture on his abrupt leave the day previous, he took the molder out and showed him the new flask, with the remark that he hoped that everything went well and they could cast the plate that day—and his hopes were realized.

Had the foreman acted in a cross, ill-tempered way, the chances are that they would have parted company at once.

I think it best to treat men as men. In this way a great deal of friction is avoided. I do not mean that a foreman should let his men do as they please, for there are many men who would take advantage of any little liberty granted them, and eventually things would get in great disorder. But I mean that when you find a man that will bear good treatment without abusing it, treat him kindly and frankly. On the other hand, if you find that you cannot grant a man a little kindness without having him take advantage of you, then the sooner you get rid of him the better. By pursuing this plan you will soon have a force of men that you can treat well, and once you have such a lot of men your burden is much lighter, for such men are generally good workmen, needing less watching and losing fewer castings.

Oftentimes in a jobbing shop work gets slack; but knowing that in a few days things will improve and business will come in, you do not care to lay your men off. At such a time go to them and frankly admit that work is slack, and that while you do not desire any loafing, or in shop language, ratting, you do not insist on them working as hard as when things are rushed. Then when the work does come in, call them up again, telling them that it is now your day, and that every man is expected to work like fury, and it will surprise you how those men will work.

A foreman should, in a certain respect, be able to read a man's character by his features, as often a total stranger, perhaps with threadbare clothes, will ask for a job. He may be a good man, but his dilapidated appearance is against him; and unless very much in need of men, the foreman will say no; while if he felt that the applicant was a good man, his reply would be yes.

There is one thing I have noticed, and that is, that a good honest workman is not afraid to look you in the eye when asking for a job. I would never, if I could help it, give a man a job, that could not look me in the face when talking to me.

Again, I would rather put a man in that merely said he was a molder and was willing to go to work and fix a rate of pay after I had seen some of his work, than to put one in that could tell me of the great shops of note that he had worked in, blowing himself up in that great I-am air.

The man that is willing to go in on his merits knows what he can do, and has confidence in his own abilities, and merely wants to show you that he is a workman before wages are set; while the man that blows himself up wishes with his talk to convince you that you are getting a first-class man before giving you a chance to judge for yourself—and the chances are that you will find his statements are lacking of proof.

It is a Long Lane that has no Turn.

In yesterday's Enquirer there was a reference to the complaint of some consumers of iron castings that they were unable to get castings as desired. The complaint set forth the attitude of the consumers, and George McG. Morris, Secretary of the John B. Morris Foundry Company, takes the matter up on behalf of the foundrymen. Mr. Morris's statement that the very people who are complaining most loudly now at having to go out of town for castings are the same that patronized out-of-town concerns when business was dull and local concerns could easily have taken care of their orders, is especially worthy of consideration by foundrymen and consumers. "In the first place," says Mr. Morris:

"Those very same consumers of iron castings who are complaining about having to leave this city in order to procure their castings are the same, who, during the dull times between 1893 and 1899, when the iron foundries were running on half time, and with reduced force, gave their work to outside foundries, because they secured prices slightly under those of the Cincinnati concerns. If they did not object then, why should they now? It is true that the foundries are at present crowded with work, but how long will it last? There is bound to come a time when the reaction will take place, and those who start in the business now will be the first to feel the effects, and the result will be a cutting of prices when some will have to give up.

"The reason for the foundries not being able to supply the increased demand for castings is the scarcity of molders, which is the case not only here, but all over the country. Great numbers of molders have enlisted in the service of the Government, and during the last six years very few new mechanics have been made on account of the dull times, hence it is a difficult task to-day to procure enough men to keep the present foundries supplied. If it was not for this fact the present foundries would very soon increase their plants and thereby their output. In regard to the advance in prices the foundrymen have not got their just deserts. The advances have only been from 20 to 30 per cent, and when you consider that pig iron has advanced 130 per cent and labor 10 per cent, not counting advances in all other materials used by the foundry, you will see that the small advance in prices of finished material is not near so much as it ought to be. There is no association among the foundrymen of Cincinnati, hence there is no allotment of the 'big jobs.' The foundrymen have a social club, which meets once a month, for the sole purpose of

enjoyment and better acquaintance among its members. In conclusion, I will say that were there 50 new foundries started in Cincinnati, there would still be some manufacturers who would procure their castings from outside sources."—Cincinnati Enquirer.

Shrinkage and Disintegration of Metals.

BY W. ROXBURGH.

In considering this subject it would be well to see at the outset how far the two terms contained in the heading of this article are synonymous, and more especially as to their relation in general machinery castings.

Shrinkage and disintegration of metals, if better understood, would greatly open our minds to a truer sense of the metals peculiarities while passing from a fluid state to that of a solid.

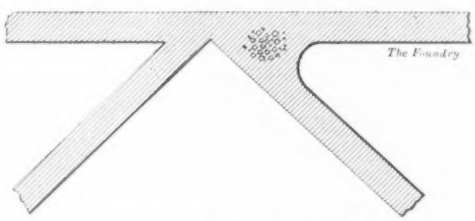
It is true that most people know that when metal is heated, whether it be in a fluid or solid mass, in cooling to atmospheric temperature it cannot move thus without being reduced in bulk, and while this is indisputable in practice and most people are content with the usual explanation that the metal has shrank, still, to molders, in the process of castings shrinking there is an unseen force at work rearranging the molecules or atoms in the integral parts of many of our castings, and it is with a view to a better understanding of these changes, as previously referred to, that I have ventured to extend on this question, which should be interesting to all who have to do with the designing of patterns for the foundry, and for the successful casting of sound and solid castings.

'Tis too true that molders have to give an account for mistakes in castings caused by careless designing in the way of badly proportioned metal, and it is in such that disintegration abounds in extravagant form, and not infrequently those disintegrated parts are mistakenly attributed to what is technically termed "blow holes."

Shrinkage and disintegration are inseparably bound together, and this is even apparent in uniform metals, inasmuch as the molecules grow larger when viewed from the skin of any given thickness to its center. Of course this is not very apparent to the naked eye inside of one inch metal, but from that thickness upwards it becomes perfectly perceptible, and with increasing thickness the atoms become more detached and in disproportionate parts must consequently be disintegrated.

I would like to say in explanation, as it applies to those whose duty it is to design for the foundry, that it is not at all times within their power to vigorously design proportionate metal; circumstances occur wherein it is impossible for the most intelligent to design castings of uniform section, and it certainly would be a mistake to adopt a hard and fast line irrespective of cost. Hence the greater need there is for the molder to have a masterly grasp of the subject of this paper, because he has been in the past to a very great extent, and will very likely be in the future, wholly responsible for spongy castings, no matter from what cause these are produced.

On the right hand side of attached illustration is an ordinary molders fillet, which shows the effect produced from additional metal when disproportioned—disintegration has been the result. The left hand side of same figure it will be observed is homogen-



SHRINKAGE OF CASTINGS.

eous; this is to a nearness what would happen with a casting such as is shown here assuming no care be taken to feed and densify the spongy part as shown on the right hand side of figure. I need hardly say that the accompanying illustration may be somewhat out of joint with practice, but all the same I hope it will serve to show what is really meant by the disintegration of metals. Technically, the disintegrated parts are usually called blow holes in the form of air bells resulting from occluded gas. This I cannot agree to, having previously stated that not five in one hundred have any right to be excused on such grounds. No doubt the cavities formed through disintegration must contain gas, since it is a fact that so many gaseous elements are in combination with the metal. Metallurgists are much at variance with each other as to a definite solution of this problem, that I am inclined to think the sooner they look to practical men for the solution of this question the better it

will be for all concerned. If there be one source better than another for an object lesson on this question I should say that that one is to be found in the common cylindrical 30-ton steel ingot casting. In it we have a rough casting approximately 16 feet long, by 3 feet 4 inches in diameter, and about four feet from top end defectiveness from disintegration begins and intensifies until the utmost limit of same is reached. Those cavities are theoretically explained as I have previously stated by occluded gas in its diversified forms, but the gas or gases contained in those cavities are generated at the time of primary shrinking and cannot be said to have completely developed until entire disintegration was completed.

Thus it will be seen that I do not recognize the theoretical explanation generally given as the true definition of the problem of blow holes. No, in my opinion what is usually classed as such belong primarily to initial cooling, the gases being secondary and of little consequence.

Again the question naturally arises, Where is the dividing line between shrinkage and disintegration? My answer to that is, the intermediate or plastic condition of any fluid metal which has been poured into casting form, and in continuance of this point I would have it to be remembered that there are three stages of transition in all fluid metals passing through the process of solidification. First, there is the fluid; second, the plastic or semi-fluid, and, third, the solid or final stage. And it is at the middle or intermediate of those transitions that disintegration begins and has its ending. This I hold to be the dividing line, and with metal uniformly disproportioned, as is frequently the case with the rim and grooves of rope pulleys, the mischief and evil created through the formation of those disintegrated parts is accomplished. Having thus crossed the dividing line, we may safely assert, at least as far as practicabilities are concerned, that there can be no appreciable shrinkage until the plastic stage is reached, which is the disintegrating point.

In conclusion, and after giving the subject great consideration, I am inclined to believe we must recognize shrinkage in its primary form as the force or cause of disintegration, and that all disintegration is completed in the plastic condition of metal; further, everything that is cast and in a cherry-red condition, and with whatever disintegration exists especially common to disproportionate castings, has now become a fixed quantity, subject to whatever improved density takes place in the further movement towards absolute shrinkage. Therefore, I hold that until there be a more acceptable recognition of the principles communicated here, and a closer examination of the habits of fluid metals passing through the stages previously touched upon to their final condition of absolute shrinkage, I am afraid that the ambiguity relating to the question of blow holes will remain in the school of metallurgy much in the same condition of doubt as has hitherto existed. I should have those that are interested in this branch of foundry science to remember that what this paper contains is but the opinion of one man who has given this subject special attention because of its importance to him as a practical molder. One might search the whole vocabulary of foundry subjects or practicalities pertaining to foundry practice and nowhere could he find a subject of so much importance. It is the key to the greatest success attainable among the many perplexities that may be said to daily confront the responsible foundry foreman.

But do not misunderstand me here because I emphasize a positive fact when I state that as long as the art of founding exists there will be good, bad and indifferent castings made. Nay, supposing the inquiring one was to swallow and digest a hundred times over all that this paper contains he will, and frequently at the least expected time, have misfortunes in the foundry. But while this is so, I assert that the highest possible results for good will be obtained through fully keeping our minds open for theory, from whatsoever source it is to be found. This, with an observant, varied and intelligent practice, will enable molders to take their stand in the wide fields of metallurgy and mechanics, and also enable them to refute error at the proper time, and thus the better fortified they will be for the everyday perplexing routine of foundry life.

Size of Snap Flasks—Cheap Core Mixture.

On page 213 of your January issue I noticed a question pertaining the average size of snap flasks in general use. I do not believe 14″x16″ would be the average in this section although we admit that 14″ is a trifle above the average width, while in length 16″

is comparatively small. Speaking of snap flasks (open flask) a few years back 14″x16″ would be considered large, but nowadays very large pieces are made on the bench in all kinds of flasks—open flasks, and tight wood and iron flasks. Traveling benches were invented for large work, giving the operator a chance to place his molds on the floor a piece at a time. In our works the writer has used snap flasks on the bench having a dimension of 13″x23″; 16″x17″ and 15″x25″ wooden tight flasks; on another job iron flasks, 14″x22″, with 4½″ drag and 5½″ cope with 1½″ raise. Flasks of these dimensions are usually worked side by side so that each man can help the other in case of need. Invariably the largest flasks for snap molders are to be found in malleable shops where they are prepared to take an order without any delay or unnecessary expense. The dimensions in them ranging from 13″x14″ in width to the length of the reach of the molders' arms. A cheap compound for cores would be common lake sand with flour siftings or sweepings, ratio 1 to 10.

Then and Now.

BY SHAKESPEARE.

I don't know what's the matter
With the molders here of late;
They do so much more molding
Than we did in '68.
I say in '68 because
It was then I quit the floor,
And quit a ramming up the sand,
And went to keeping store.

Ever since I quit the trade,
From foundries I've kept away,
And never went near one
Until the other day
I happened to be in St. Louis,
And into a foundry strayed—
I tell you it was a caution
The speed those molders made.

A putting down car wheels
And other kinds of stuff—
If I'd a had to do it
I'd thought it rather tough.
For when I was a molder
And a working at the trade,
We thought we were a working
When a few flasks we made.

The men they didn't work so hard—
They'd laugh and talk and joke;
And when you got real good and tired
You could stop and take a smoke.
These days have passed and gone,
Alas! you'll never see them more,
If you happen to be a molder
Upon the molding floor.

For I'll tell you they have got things
Down rather pat and fine;
And if you wish to hold your job
You'll have to get in line.
For there's so much competition
Between the foundries of to-day,
That a boss is not likely
To let you throw your time away.

For things have changed of late—
A minute now is gold;
And a molder cannot take his time
As he did in days of old.
Now he has to hustle
All the live-long day—
And his castings must be good,
Or else he gets no pay.

But I don't know but all in all,
If a change I were to make,
Instead of seeking a soft job,
To the sand heap I would take.
For it certainly has a bright side,
When viewed from all around—
For a molder's always happy
When his castings are good and sound.

And then, too, it's interesting,
When the pattern it is big,
And the foreman comes and tells you
To begin to fix your rig.
Then when the casting's made and cleaned,
And is smooth and sound as a dollar,
Why then you feel so awful good,
You could just jump up and holler.

Foundry Irons.

BY EDWARD KIRK.

Many old foundrymen, as well as molders, have never seen a blast furnace, and have only a limited idea of how pig iron is made, or what is meant by the terms hot blast, cold blast, charcoal, coke and anthracite iron.

The writer was employed in a foundry for a number of years as a molder before he learned the meaning of these terms, and the kind of castings the different irons were best suited for. He has frequently met foundry foremen who knew nothing about irons other than those used in the foundries at which they were employed. If called upon to use other irons, these men would know nothing of their characteristics, and many valuable castings would be lost, or prove unsuitable, before they became sufficiently familiar with the iron to know for what class of castings it was best suited, or how to mix and prepare the iron for the work to be cast.

This state of affairs is not to be wondered at when you come to consider that the characteristics of the various foundry

irons have never been deemed of sufficient importance by writers on foundry matters to accurately describe them or indicate the class of work for which they are best suited.

The knowledge of irons other than that being used in many foundry districts is, to a great extent, only a tradition, which has been handed down from one generation to another, and even this knowledge, in many cases, has become extinct.

A short description of foundry irons will, no doubt, be of interest and of value to many founders, foremen and melters.

BLAST FURNACES.

The blast furnace is constructed upon the same general principles as the cupola furnace. It is cylindrical in shape, is supplied with air for combustion by a forced blast through tuyeres placed near the bottom of the furnace. The latter is charged with fuel, ore, flux, etc., from the top, and not through a charging door in the side, as in the cupola. The iron is drawn from the furnace at the bottom and conveyed through a runner made of sand in the floor of the casting house to the pig-iron molds, also made in sand in the floor of the casting house, or into pig-iron molds.

The iron cast in sand molds is called sand pig, and that cast in iron molds sandless or chilled pig. Several new devices are now being tried for casting sandless pig that prevents chilling of the iron by the mold; this iron is known as sandless foundry pig.

The blast when forced into the furnace at the temperature of the atmosphere, or the same as that forced into the cupola, is known as a cold blast, and the iron produced from the furnace a cold-blast iron. When the blast is heated before entering the furnace it is called a hot blast, and the iron produced is called a hot-blast iron.

A blast furnace may be open or closed at the top. The open furnaces permit the gases to escape, and are generally cold-blast furnaces.

The closed furnaces are closed by a hopper device resembling a bell, and are known as bell-top furnaces. The fuel, ore, flux, etc., for a charge is dumped upon the bell, which is suspended in the furnace at the top, and the charge is permitted to fall into the furnace by lowering the bell to a sufficient extent to admit of the stock sliding off the bell into the furnace. The bell is then raised into place and the furnace top closed.

The gases are permitted to escape from the furnace through large pipes connected with it near the top and are used for heating the blast, which is heated to a high degree in a hot-blast stove before entering the furnace. The bell-top furnaces are all hot-blast furnaces.

Irons are also designated by the fuels used in smelting the ores, thus: An iron smelted from its ores with charcoal and a cold blast is called a cold-blast charcoal iron. Those smelted with charcoal and a hot blast, a hot-blast charcoal iron. Iron smelted with coke, a coke iron; and those smelted with an anthracite coke, an anthracite iron. All coke and anthracite furnaces are hot-blast furnaces, and the iron from them hot-blast iron.

CHARCOAL IRONS.

The charcoal irons, cold and hot blast, are comparatively free from the impurities found in coke and anthracite irons, imparted to them from the fuel with which they are smelted, and present the characteristics of greater strength than either of these latter irons. Charcoal irons are cast into long slender pigs, with a V-shaped groove in them on each side to facilitate breaking the pig into four pieces. The pigs are broken with difficulty even when grooved in this manner, and a two-handled sledge, weighing from 20 to 30 pounds, handled by two men, is frequently required to break them. When broken, the fracture presents a rough, torn appearance, with a sharp-pointed crystal that jags the fingers when pressed upon them. They are graded Nos. 1, 2, 3 and 4. The No. 1 is a soft iron, No. 2 a grade harder, No. 3 a mottled iron, and No. 4 a white iron.

Cold-blast charcoal iron was the first iron ever made in this country, and was used in the manufacture of all kinds of castings, even for stove plate, which was not made so thin many years ago as at the present time. The No. 1 is high in combined carbon, and its tendency to chill when cast into light work is so great that it runs white on thin edges, and at any great distance from the gate, in light castings. The writer, when visiting an old foundry in Maryland at which stoves were made from this iron, many years ago, learned that only the softest No. 1 pig had been used in their manufacture, and that the gates and scrap from the work were not remelted, but were thrown into the dump and only pig melted to insure soft castings. A dump was point-

ed out that was said to contain many tons of gates and scrap from this foundry.

The cold-blast iron was used in the manufacture of gear wheels, cranks, and all parts of machinery requiring great strength, and before the introduction of the steel hammer into rolling mills, and the age of steel, was the iron exclusively used in making large shafts for steamboats, mills, etc.

Many amusing stories are told by old foundrymen about casting these shafts. One recalled to mind is the casting of shafts on end and making them double the length required, that the pressure of iron in the upper end of the mold might make the iron in the lower end more dense or close; only the lower end beng used for the finished shaft. This is said to have been a common practice in foundries having a high reputation for good shafts. The founders do not appear to have known that a close iron might have been obtained by using the lower grades of pig, or mixing the lower with the higher grades and casting the shaft of its proper length. All the iron cannon used in the War of the Rebellion in this country, 1861-65, were made of this iron; hundreds of them were cast at the foundry of the Fort Pitt Works, Pittsburg, Pa., and the writer saw many of them when being finished at the lathe at these works. The iron cut like wrought iron and many turnings from 20 to 30 feet long were hung up around the lathe room to show the quality of the iron.

This iron, owing to its high price and chilling tendency in light work, is at the present time only used by founders for special work, such as malleable iron, car wheels, cylinders, etc. In malleables it gives a stronger and smoother iron than any other and, in fact, is the only iron from which first-class malleable iron can be produced. In car wheels it makes a strong wheel and gives a chill of any desired depth when the different grades of the iron are properly mixed.

In cylinders it makes a strong, clean, close iron, free from grit, that polishes like steel and does not wear rapidly or cut the piston head or packing ring.

For car wheels and cylinders it may be mixed with coke or anthracite irons, and has been used to some extent in this way and good results obtained. But it must be remembered that the characteristics of a charcoal iron decreases in proportion to the amount of these irons that are added to it in a mixture, and the good qualities of a charcoal iron may be entirely lost if too large a percentage of other iron is used.

No rule can be given for mixing, as the percentage must necessarily vary with the quality of iron used and the resulting quality desired.

Attempts have been made to produce by chemical analysis an iron from coke or anthracite irons having the characteristics of a cold-blast charcoal iron, and some success is said to have been met with in malleable iron and car-wheel works. But oleomargarine does not possess all the qualities of a good butter, and the imitation cold-blast charcoal iron will no doubt be found to be deficient in some of the characteristics of the genuine article.

HOT-BLAST CHARCOAL IRON.

Hot-blast charcoal iron presents all the characteristics of the cold blast except its chilling tendency, which is lessened to a considerable extent by the reduced amount or per cent of combined carbon and increased per cent of graphite carbon contained in the iron.

A deep chill cannot be obtained from the No. 1, but a chill of any desired depth may be obtained from a mixture of the lower grades. This mixture, however, does not give a chilling iron equal to the cold blast for car wheels.

The No. 1 and 2 when mixed in proper proportion runs very fluid and soft in light castings, such as stove plate, hollowware, bench work, pulley rims, etc., and is the very best foundry iron for light castings requiring softness and strength.

This iron for many years was the only iron used for this kind of castings, and even after the introduction of coke and anthracite irons, at a very much reduced price compared with that of charcoal iron, was used by many foundrymen for years, and is still used exclusively by some of the old founders in localities where it can be procured at a moderate advance over the other irons.

Some of the best known and most famous brands of this iron were those of the hanging rock region, a mountainous district, on the Ohio River, in the vicinity of the town of Hanging Rock, Ohio. The mountains or hills in this vicinity furnished wood for charcoal for many small furnaces that supplied the entire Ohio Valley from Pittsburg to the Mississippi with foundry iron for many years. Some of these furnaces are still in blast, but most of them have been aban-

doned, owing to the scarcity of wood, and the production of this iron has also been much reduced in other localities for the same reason.

One of the tricks of founders after the introduction of coke and anthracite irons was to keep a pile of the charcoal iron in the yard to show customers the quality of iron used in their castings. When a customer desired a very strong iron in his castings, he was taken into the yard and a pig of this iron broken after numerous blows with a heavy sledge. This test generally satisfied the customer, who believed he was getting an extra quality of iron, while the pig broken was likely the only one that went into many tons of his casting, the castings being made from the cheaper grades of iron.

COKE IRON.

This is probably the best known of all the foundry irons, for it is the iron used in a large majority of the foundries of this country making a general line of castings such as stove plate, hollowware, bench work, light and heavy machinery castings, etc.

The characteristics of the iron vary to some extent, owing to the quality of the ore from which the iron is smelted. That made from some of the Lake Superior ores is very strong. The No. 1 presents a sharp-pointed crystal in the fresh fracture, runs soft and strong in moderately heavy castings; but runs very hard in stove plate and other light castings. That made from some of the southern ores is very weak, the No. 1 presents a dull flat crystal in the fresh fracture, and runs very soft in light as well as heavy castings. The best iron for light castings is that having these two characteristics in combination, and such an iron is made by furnacemen making a specialty of foundry irons from a mixture of different ores.

These characteristics of the iron should be remembered when ordering irons, and an iron selected suitable for the work to be cast.

Coke iron was first graded No. 1, No. 2 mottled and white iron. Later, it was graded Nos. 1, 2, 3, 4, 5, 6 and 7, with the addition of No. 1 A, No. 2 A, or No. 1 X and No. 2 X. This fine grading was designed to accurately indicate the quality of iron and enable the foundrymen to order exactly the quality best suited for the work to be cast.

An effort is now being made by furnacemen in some localities to do away with grading by fracture, and grade from chemical analysis, which is said to more accurately indicate the characteristics of the iron and enable the foundrymen to select an iron exactly suited for his work.

This grading is based to a large extent upon the per cent of silicon contained in the iron. A high silicon, a soft iron. A low silicon, a hard iron. Silicon is placed in the iron in any desired per cent by the grade of ores smelted, and irons are made to correspond with the numbers formerly used in grading. Thus, a 3 per cent silicon iron presents similar characteristics to an iron formerly graded No. 1; a 2 per cent silicon those of No. 2, and so on.

Coke irons are cast into short, thick pigs, as compared with those of charcoal irons. These heavy pigs, which are almost double the thickness of the charcoal pig, are broken more readily than the slender-grooved pigs of that iron. Even the strongest of the best grades in no way compares with charcoal pig for strength.

The strength of the iron is indicated to some extent by the color, as well as shape, of the crystal. A dark bluish cast in the fresh fracture indicates a stronger iron than a light or silvery cast. The No. 2 iron runs stronger in heavy and moderately heavy castings than the No. 1, but weaker in light castings, in which the iron is chilled to some extent by sudden cooling.

For light castings the best results may be obtained by mixing the No. 1 and No. 2 in the proportions of one-half of each, or two-thirds of No. 1 and one-third of No. 2. A mixture of about these proportions generally makes an iron that runs softer and more even in light castings than all No. 1.

The No. 3 grade is seldom used, except for very heavy castings; it is then generally mixed with the No. 2, and is employed in the mixture for the purpose of giving strength to the castings.

ANTHRACITE IRON.

The furnaces producing this iron are principally located in Eastern Pennsylvania, New Jersey, Maryland and New York, and were the source from which these sections of the country derived their supply of foundry irons for many years.

The furnaces were generally small ones and with anthracite coal, which smelted the

ores very slowly, produced but a limited amount of iron. After the improvements in the manufacture of coke, it was found that these furnaces could be made to produce two or three times more iron with coke fuel than with anthracite fuel. This, together with the decrease in the price of coke, as improvements were made in its manufacture, induced the anthracite furnacemen to change their furnaces to coke furnaces. This change has taken place to so great an extent that very few anthracite furnaces are in existence at the present time. Even the anthracite furnaces in the Lehigh Valley, the very center of the anthracite coal fields, have changed to coke. The iron as a foundry iron was far superior to coke iron in the early stages of the manufacture of that iron; but with the advancement in the manufacture of coke, and consequent improvement in coke iron, the two irons presented very similar characteristics as foundry irons. The pigs of the irons are cast about the same size and shape, and it would be difficult, or impossible, to determine an anthracite from a coke iron from the fracture. The two irons present a similar appearance and, as foundry irons, are so near alike it would be useless to describe anthracite iron in detail after having described coke irons.

SILVER GRAY IRON.

Silver gray iron is a foundry iron sometimes produced by furnaces when overheated, and has been called a burned iron. This iron was never a regular furnace product, but was a chance product, and generally sold at a very much reduced price from the regular or standard iron of the furnace. It was occasionally seen in foundry yards some 25 years ago, but was never sufficiently plentiful to come into general use.

The writer has not seen it or learned of its being used for many years, and since the improvements in blast furnace practice, it may not be made.

The fresh fracture of this iron in the pig was very similar in appearance to that of a white iron, and was only distinguished from white iron by the silvery gray cast from which it derives its name.

The iron was very soft, run fluid, and presented many of the characteristics of high silicon iron of the present time. It was very weak and unsuitable for castings when melted alone, and was used as softener when melting the lower grades of pig or scrap iron.

HIGH SILICON IRON.

Silicon is an element that enters freely into combination with iron. It is found in combination with iron in its native state in large proportions and may be added to iron in the blast furnace. Great beds of iron ore containing this element in large proportions have been found in this country that are very accessible, and by reason of the softness and brittleness imparted to them by the silicon, they are easily mined and broken up, and a cheaper iron is made from this ore than many others.

The iron produced from this ore is of an inferior quality. Rolling mill men and the manufacturers of steel have no use for it, and it is being pushed forward as a foundry iron.

The only requisite quality this iron possesses as a foundry iron is weight, and this quality is offset to a large extent by its rottenness. When cast into sash weights, or other slender weights, they must be handled with care to prevent breakage.

Silicon in large proportions imparts to iron a peculiar grit, that removes the edge from a finishing tool about as rapidly as a grindstone. It also reduces the chilling tendency of cast iron and is claimed by the advocates of silicon iron to be a sofetener; but I think this is a mistake, and that carbon will yet be found to be the true softener. But this iron, as before stated, is being pushed forward as a foundry iron, and as the writer has melted many tons of it in various proportions, a few suggestions on melting and mixing it may be of value to foundrymen.

The proportion of silicon that may be used in a foundry iron without impairing its quality to any great extent varies from ½ to 3 per cent, according to the kind of casting the iron is to make, thus a mixture for heavy machine castings requiring great strength needs none of this iron. Light machinery castings to be finished may require from ½ to 1 per cent, and stove plate, bench work, and other light, thin castings, from 2 to 3 per cent. This percentage of silicon reduces the chilling tendency of the iron, and prevents to a large extent hardness on thin edges and at a distance from the runner or gate.

To distribute this per cent of silicon evenly through the castings when a high silicon iron is used in a mixture with a low grade of pig or scrap, requires very nice cupola practice.

The aim must be to get the small per cent of high silicon iron evenly distributed through the large per cent of other irons when in the molten state. This can only be done by careful charging and tapping.

When all pig is melted with only the foundry scrap, the high silicon iron should be broken in pieces that will admit of it being mixed with the other pig; and when charged, care should be taken to not place the silicon iron all together, but to distribute it evenly through the other pig, so that when melted it may have the opportunity to mix with the other iron in its descent through the fuel to the bottom of the cupola and be more evenly distributed in the molten mass at the bottom. The iron should be melted very hot and the cupola not tapped close, or a small tap hole made and a considerable body of iron permitted to remain in the bottom of the cupola, when a continuous stream is drawn. It will also be found of advantage to place a large ladle holding from 300 to 500 on trussles in front of the cupola and pour the iron from this ladle into hand or other small ladles for light work.

When melting heavy scrap and high silicon pig, the same precaution should be observed to insure a homogeneous iron.

When melting light scrap and high silicon pig, such as that recommended to carry 90 per cent of scrap, the silicon iron should be broken in very small pieces and mixed with the scrap in charging in a way that will insure the pig and scrap melting at the same time, and mixing as it descends and also in the bottom of the cupola.

This would not be the case if the pig was all charged on the fuel with the light scrap on top of it, unless the entire charge was melted before a tap was made. When melting this grade of irons the precaution should always be taken to mix the iron in a large ladle as well as in the cupola.

Pig irons are now being made for foundry work that contain from ½ to 3 or 4 per cent of silicon, and foundrymen will secure a more homogeneous iron for their castings by purchasing an iron that contains the amount of silicon said to be necessary for their grade of castings than by purchasing an iron very high in silicon and mixing it with an iron very low in silicon, or free from it.

When castings are deficient in strength, and breakage is heavy in the tumbling barrels, or in the handling, the silicon should at once be reduced by increasing the irons low in silicon in the mixture.

When the iron in finished work leaves the tool of a lathe or planer like particles of half dried sand and crumbles into small particles readily, the silicon is too high. Such iron generally takes the edge off of tools very rapidly, is difficult to finish smoothly, and if finished for small shafts cuts out bearings very rapidly, or if finished for bearings, cuts the shaft.

SCOTCH PIG.

Scotch pig is the common name by which numerous brands of pig iron imported from Scotland are known in this country.

Thirty or forty years ago this iron was extensively used as a foundry iron, and many founders believed they could not make soft castings without Scotch pig. At the present time, its use is restricted almost entirely to seaport cities and towns, to which it is brought by vessels as ballast, and sold at a less price than American foundry irons.

The iron is cast into short thick pigs, the fresh fracture of which is of a dark bluish cast, with the large crystal called on open iron. It is high in graphite or free carbon, and when broken small flakes of graphite freguently fall from the fracture. The iron is deficient in stength and the large pigs are easily broken with the sledge. The qualities of the different brands of Scotch iron vary to considerable extent, and the price varies from one to two dollars per ton, according to the quality and reputation of the brands.

The best brands run very soft and clean in light work, and some years ago were the only irons used for stove plate and hollow-ware, but they have generally been replaced for this work by the stronger soft brands of domestic irons.

Some of the poorer brands run soft but so kishy that it is difficult to make perfect castings from them. The kish collecting in spots on the surface of the castings, making thin spots or holes and in heavy work collecting in short angles or edges, causing rounded and uneven corners or edges. Other brands run very dirty, as well as hard and are only fit for weights or very common castings.

Note.—Kish is a name given by founders to a soft dark substance resembling black lead, that is forced out of a very soft iron

when in a molten state and when cooling. In thin castings it runs before the iron in the mold and causes rounded edges or corners, similar to those made by blacking, dusted on too heavy, and washed before the iron. In heavy casting it collects on the surface in spots, and around the edges.

It adheres firmly to the casting, but is soft and easily broken off leaving a smooth surface. Kish is only found in very soft iron, in which the softness is due to graphite or free carbon, and comes from an excess of this element in the iron

Kish is not found in foundry irons used at the present time, to the same extent it was in those used some years ago, and many of the younger founders have probably never heard the term.

AMERICAN SCOTCH PIG.

When the Scotch pig craze was at its height, a number of furnacemen in this country with the usual American inventive genius, conceived the idea of imitating Scotch pig and a number of brands of iron were made and put on the market, called American Scotch pig.

These irons, in many cases, were far superior as foundry irons to the genuine Scotch, and in numerous cases soon replaced it in foundries making light work, for which it was claimed only Scotch pig could be used.

Among the brands of American Scotch that attained a high reputation were Briar Hill and Cherry Valley. The writer has melted many tons of these irons for light as well as heavy castings and found them to run as soft as any brands of Scotch pig he ever melted and far superior to them in cleanliness and strength.

There were many other brands of American Scotch in different sections of this country that attained a high reputation, and are still in the market as foundry irons, but as Scotch pig is not in demand to the extent it was some years ago, furnacemen have generally dropped the term American Scotch, and the irons are known only by their local or furnace names.

FOUNDRY PIG.

This is the name generally given to pig iron made in the foundry from piles of refuse iron that have collected about the foundry or yard and are melted at the end of a heat and run into pigs, to get the scrap out of the way, and in a shape to be melted with other irons in the regular heats. This iron is generally gang-way or cupola scrap that has been allowed to accumulate, or burnt iron and other refuse that has been thrown out of the scrap pile.

This scrap makes a very inferior pig iron that will not mix when remelted with either pig or scrap iron to make a homogeneous casting. The poorest brand of pig iron the founder has to contend with is his own make of foundry pig. When he has once made a good sized pile of it he generally has pig iron in the foundry yard as long as he is in the foundry business.

Fires.

Ajax Iron Works, Corry, Pa. Loss $5,000.

Baker & Hamilton's foundry at Benicia, Cal., burned Feb. 4.

Union Iron & Foundry Co.'s plant at St. Louis, Mo., burned Jan. 31.

W. & A. Fletcher Co.'s brass foundry at Hoboken, N. J., was recently burned.

J. Morton Poole Co.'s foundry at Wilmington, Del., was slightly damaged recently.

The machine shop and foundry of Sprout, Waldron & Co. at Muncy, Pa., burned Feb. 7.

A. & T. McKenna's brass foundry at Pittsburg, Pa. Damage in the neighborhood of $3,000.

The Franklin Machinery Co., of Providence, R. I., suffered from a small blaze recently.

F. M. Davis Iron Works at Denver, Colo. Loss estimated at $60,000, mostly covered by insurance.

The Century Stove Co.'s plant at Dighton, Mass., burned. There is but little chance that the plant will be rebuilt as it was offered for sale.

One of the car wheel foundries attached to the plant of the Southern Car & Foundry Co.'s plant at Gadsden, Ala., burned recently. Loss $20,000.

The brass works of the Goelitz Manufacturing Co., Kokomo, Ind., have been destroyed by fire. Loss $12,000, insurance $9,000. The fire started from natural gas in the foundry department.

A Massachusetts Joke.

Iron men in Pennsylvania are storing pig iron for higher prices. They are sort of iron pigs, as it were.—Franklin (Mass.) Sentinel.

Convention of the N. F. A.

The recent convention of the National Founders' Association, held in the city of Detroit, February 1st and 2d, marked in a very certain manner an epoch in the history of the foundry business of North America.

As our readers are of course all more or less familiar with the purposes of this Association, any extended reference to that subject is entirely unnecessary, but it may not be amiss to refer briefly to the meeting and its results.

Those who were in any way strangers to the inner workings of the organization or the policies and ideas of those who have been from time to time entrusted with its management, are always impressed with the conservative and even kindly way in which all matters, having direct reference to the labor question in its entirety or any particular phase of it, have been discussed at the different meetings held by the Association since its organization.

The thought so common in the minds of many that the National Founders' Association was a gigantic machine that might possibly be used as a huge force to curtail the liberties or reduce in any way in the social scale those who are employed by its mem-

bers has time and again been demonstrated to be an erroneous one.

On the contrary, the probabilities are that the day is at hand when the conscientious, honest and industrious employe is going to find his condition greatly benefited and more secure than it has been in the past.

That Trades Unionism alone is not for one reason or another able to establish as a standard the ideal condition, is self-evident to all.

Either the ultra aggressiveness and ignorance of economic laws so often found among its members or the frequent submission to occasional, unwise leadership on the one hand, or the greed, unfairness and anxiety to take every advantage, fair or unfair, on the part of some employers, has produced a situation that in many cases is entirely unsatisfactory.

There is a lack of uniformity in the conditions prevailing in different and even adjacent localities that should not be and there is an altogether too evident desire to substitute for the word "right" that of "might."

The National Founders' Association has been forced to rectify many existing evils, and while keeping in mind the cardinal principles of justice, equity and fair dealing in all relations with its employes, it yet means to insist upon a strict observance of those same principles upon the part of employers.

It is as unfair for the individual employer, because he can, to endeavor to enforce conditions in his shop alike unjust to his employes and fellow manufacturers as it is for the employe to attempt to handicap the employer by insisting on equally obnoxious conditions.

In order to attempt a settlement of the many vexed problems constantly arising, unity of action is desirable for many reasons, not the least important of them being that it inspires and guarantees respect and the National Founders' Association with its already powerful membership which is so rapidly increasing and with its determination to see justice done by and to all parties, has entered upon a campaign that must undoubtedly be crowned with success.

It is doubtful if any American association of any kind has ever been as exceedingly fortunate in the happy selections that have been made of men to guide its affairs as the National Founders' Association.

Could a careful and close examination of all the facts, could a comprehensive analysis of the entire situation and a survey of all the possibilities in that line known to the foundrymen of the country, produce three other men so peculiarly equipped and so magnificently endowed by instinct and education to handle and guide an organization such as the N. F. A. aims to be, in a way that would command such a measure of enthusiasm and approval as Messrs. Pfahler, Gates and Letchworth?

Is it any exaggeration to say that they are and have been making a mark upon the history of our country, that they are establishing precedents and formulating solutions of the great problem that will exist as a living monument to their zeal, ability and integrity for far in the future?

It gives us a great deal of pleasure to be able to present to our readers two views of the beautiful silver loving cup presented by the National Founders' Association to W. H. Pfahler, of Philadelphia, the first president of the organization.

To Mr. Pfahler more than anyone else was due the conception of the idea and the two years preliminary work that resulted later in the formation of the Association.

During that period he gave unselfishly of his time and means, traveled to a large number of the leading cities of the country, called upon individual foundrymen and addressed meetings at which he explained the plan upon which this organization was afterwards founded.

He very unwillingly accepted the responsibilities of serving as its first president, but during this time much of the foundation was laid for the present successful Association.

But unlike the majority of men who, upon serving a term of office retire, not only from the office but from active work, Mr. Pfahler's advice has been constantly sought and freely given, so much so indeed that many of the important measures decided upon from time to time have owed their inspiration to him.

As a partial appreciation of all this and of much more effort on his part of a kindred description, the Association presented to him during the recent convention the cup illustrated elsewhere.

The presentation was made by President O. P. Letchworth who, in his own matchless

style, graphically outlined Mr. Pfahler's work and with a degree of eloquence befitting the occasion, asked Mr. Pfahler to accept the Association's tribute to his universally recognized worth as a "gentleman and an honest man."

Mr. Pfahler's reply will never be forgotten by those whose good fortune it was to hear it.

He, in a way that made a deep and lasting impression, sounded the keynote of the organization's existence and held his hearers spell-bound while he pointed out what, in his opinion, should be its future policy; his final words being, "I ask only that the future of this Association shall show, as I am confident it will show, that the members, individually and as a body, shall always bear in mind: First, that the dignified position they occupy in the economics of the world must be filled in a dignified manner; and second, that the elevation of the industry and its interests can only be assured by honest, equitable treatment of all engaged therein, from the master to the humblest mechanic."

The Apprenticeship question received a large share of attention at the convention and it was conceded on all sides that it was a matter that had been sadly neglected by foundrymen at large.

During the recent hard times, but few apprentices had been installed in some lines and with the great improvement in business the foundrymen requiring skilled help are compelled to pay the penalty for their neglect in this respect.

In all probability some positive action will grow out of the report presented upon this subject by a committee, consisting of Messrs. W. H. Pfahler, Fred Frazer, H. W. Hoyt, F. T. Towne and Walter Perry.

The officers and members of the different district committees selected for the ensuing year are as follows:

FIRST DISTRICT COMMITTEE.

Chairman, M. H. Barker, American Tool & Machine Co., Boston, Mass.; vice-chairman, F. T. Towne, Yale & Towne Mfg. Co., Stamford, Conn.; Geo. B. Buckingham, Arcade Mall. Iron Co., Worcester, Mass.; H. A. Carpenter, A Carpenter & Sons Fdy. Co., Providence, R. I.; Walter Perry, Farrel Fdy. & Machine Co., Ansonia, Conn.

SECOND DISTRICT.

Chairman, H. N. Covell, Lidgerwood Mfg. Co., Brooklyn, N. Y.; vice-chairman, G. E. Emmons, Edison General Electric Co., Schenectady, N. Y.; W. B. Burns, Syracuse Mall. Iron Works, Syracuse, N. Y.; Edward Maher, Maher & Flockhart, Newark, N. J.; Henry W. Wendt, Buffalo Forge Co., Buffalo, N. Y.

THIRD DISTRICT.

Chairman, Antonio C. Pessano, Geo. V. Cresson Co., Philadelphia, Pa.; vice-chairman, I. W. Frank, Frank-Kneeland Machine Co., Pittsburg, Pa.; Thos. E. Durban, Erie City Iron Works, Erie, Pa.; Stanley G. Flagg, Jr., Stanley G. Flagg & Co., Philadelphia, Pa.; Geo. Mesta, Mesta Machine Co., Pittsburg, Pa.

FOURTH DISTRICT.

Chairman, Jos. A. Stone, Riverside Foundry Co., Cleveland, Ohio; vice-chairman, Chas. H. Booth, The Lloyd Booth Co., Youngstown, Ohio; Thos. P. Gaddis, Dayton Mall. Iron Co., Dayton, Ohio; H. J. Gosiger, Eureka Foundry Co., Cincinnati, Ohio; W. S. Kessler, Albion Mall. Iron Co., Albion, Mich.

FIFTH DISTRICT.

Chairman, Wm. D. Sargent, The Sargent Co., Chicago, Ill.; vice-chairman, Geo. Q. Thornton, Carondelet Foundry Co., St. Louis, Mo.; Jas. Barclay, Deere & Mansur Co., Moline, Ill.; T. K. Webster, Webster Mfg. Co., Chicago, Ill.

SIXTH DISTRICT.

Chairman, F. W. Sivyer, Northwestern Mall. Iron Co., Milwaukee, Wis.; vice-chairman, Geo. M. Gillette, Gillette-Herzog Mfg. Co., Minneapolis, Minn.; Chas. Allis, The E. P. Allis Co., Milwaukee, Wis.; C. M. Power, St. Paul Foundry Co., St. Paul, Minn.; E. H. Walker, J. I. Case Thresh. Machine Co., Racine, Wis.

SEVENTH DISTRICT.

Chairman, Edgar McDougall, John McDougall, Montreal, Que.; vice-chairman, John M. Taylor, Dominion Radiator Co., Ltd., Toronto, Ont.; Thos. Drummond, Montreal Pipe Foundry Co., Montreal, Que.; Walter H. Laurie, Laurie Engine Co., Toronto, Ont.; John P. Northey, Northey Mfg. Co., Ltd., Toronto, Ont.

Deaths.

C. A. Treat, president of the C. A. Treat Manufacturing Co. at Hannibal, Mo., died in that city recently in his 72d year. Mr. Treat's career has been a very busy one, a number of foundries and car works having been built by him before organizing the company which bears his name.

Louis F. Powell, manager of A. C. Powell & Son, at Syracuse, N. Y., died recently, aged 52.

William Eldridge Whitcomb, of Smith, Whitcomb & Cook, Barre, Vt., passed away recently, aged 73.

Henry Blundell, founder of the firm of Henry Blundell & Co., at Providence, R. I., died a short time ago, aged 84.

Elijah Bull, treasurer of the Reading Stove Works, Orr, Painter & Co., passed away at Reading, Pa., aged 65.

W. F. Cash, of Fairview, Kansas, will erect a small foundry at that place.

The Peru Steel Casting Company, of Peru, Ind., have made an increase of $250,000 in their capital stock, the entire stock now being $650,000.

The Geo. F. Blake Mfg. Co., of Cambridge, Mass., has started a brass foundry at Warren, Mass., in order to supply its own demand for castings.

The Willamette Iron Works, Portland, Ore., have been revived and renamed the Willamette Iron & Steel Works. It is understood that ex-Senator H. W. Corbett is back of the new concern.

NOTICE!

Advertisements in this column, 30 cents a line for each insertion About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.
Answers addressed to our care will be forwarded

TO SUBSCRIBERS

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

CHEMIST, would make iron or other analysis. Rates low. Yearly contracts. Prompt, accurate. "Chemist," Ripon, Wisconsin.

WANTED—Modern cupola. Second-hand. First-class condition. Capacity three to five tons. Lyon Iron Works, Greene, N. Y.

FOR SALE—One 3 to 4 ton jib crane, hand power. Blue print and price on application. JAMES LEFFEL & CO., Springfield, Ohio.

FOR SALE—Foundry and machine shop with tools, good buildings 50'x120', well located, easy terms. Address F. D. Freeborn, Knoxville, Pa.

FOR SALE—Foundry and machine shop. Tools, machinery and real estate included. A fine opportunity for a good man. Address Thomas Ianson, Butler, Ind.

FOR SALE—To settle estate. Iron foundry, Hinsdale, N. H. Good water-power. Capacity of stack, 5 tons daily. Address, M. L. Merriman, Executrix, Northfield, Mass.

FOR LEASE—Foundry plant, admirably located in Detroit, in excellent repair; capacity two hundred moulders. Write Michigan Malleable Iron Company, Detroit.

WANTED—Good machinery molders accustomed to marine engine work. Steady work and good wages. Apply, Newport News Iron & Brass Works, Newport News, Va.

WANTED—Position as superintendent Malleable or gray iron foundry. Proficient engineer. Can make estimates and handle men. Address "Superintendent," Box 378, care THE FOUNDRY.

WANTED—Situation by competent foundry foreman. Thoroughly posted in melting and mixing iron for light and heavy work. References. Address "Foreman," Box 381, care THE FOUNDRY.

WANTED—A young man, 27 years of age, sober and industrious, with twelve years' experience in all kinds of bench molding, desires a position. Address, W. L. G., Box 318, Smith's Falls, Ont.

WANTED—Experienced foundry foreman wishes position where brains are appreciated. Is familiar with heavy and light work, fitting up special rigging, etc. N. E. preferred. Address "X," box 371, care THE FOUNDRY.

FOR SALE—One second-hand steam engine, 50 H. P., plain slide valve; size 12x16 in.; fly-wheel 60 in. diameter; in service and can be seen in use if desired. Gould Steel Company, Indianapolis, Ind.

FOR SALE—Second hand. One 63-inch Boston blower, 11-inch outlet, good as new. One 5-ton foundry screw ladle, in good working order. AMERICAN HOIST & DERRICK CO., St. Paul, Minn.

WANTED—Position by a foundry foreman at present employed in the East. Would take a position anywhere. Have handled from 30 to 40 molders. Address "I. M.," Box 380, care THE FOUNDRY.

WANTED—One cupola, diameter of shell 32 or 36 inches, also a cupola from 44 to 48 inches diameter of shell. Address, with full description and price, Acme Road Machinery Co., Frankfort, N. Y.

WANTED—First-class molder as assistant foreman. None need apply unless capable of making good foreman. To an energetic and capable young man this is a good opportunity. Address "Assistant," box 366, THE FOUNDRY, Detroit, Mich.

WANTED—Twenty first-class machinery molders who are well skilled in work made in green and dry sand. Good wages and steady employment to right kind of men. Union shop. Address, "Machinery," Akron, Ohio.

WANTED—Position as foundry foreman. Fifteen years' experience in heavy and light work, green sand and loam. Thoroughly posted in mixing iron and handling large force of men. References furnished. Address, H. J., Box 373, care THE FOUNDRY.

WANTED—Assistant foreman wanted in a malleable foundry in the Middle States. Must have some knowledge of molding machinery and up-to-date methods. Position permanent; give references, age, etc. Address "Malleable," Box 379, care THE FOUNDRY.

WANTED—Assistant foreman under 40 years of age for a New England stove works. Must be experienced, competent, energetic and capable of managing men. First-class references required. Salary according to ability. Address, "Assistant," Box 372, care THE FOUNDRY.

FOUNDRY FOREMAN WANTED—A foundry in one of the South Atlantic States is wanting a foreman. Foundry employs 8 to 12 molders; makes iron, chilled iron and brass work. A man of about 40 years preferred, but no objection to older or younger man who is competent. Correspondence, giving experience, former employers, and salary, will be appreciated. Address, "Iron Works," Box 376, care THE FOUNDRY.

POSITION—Wanted by an experienced and up-to-date metal pattern-maker on fine and difficult work. Inventive and used to experimental work. Familiar with modern labor-saving devices in pattern-shop practice. Competent to take charge. Address, B., Box 375, care THE FOUNDRY.

FOUNDRY BLOWERS—
No. ¼ Root, latest style, $75.00.
Nearly new No. ½ Root, latest style, $95.00.
Excellent order, No. 1 Root, imp. style, $115
Perfect order, No. 4 Baker, little used, $200.
Blowers bought, sold, exchanged and repaired. A. ASHER, 109 Liberty St., New York.

"FOUNDRY MANAGER, wide experience as manager, desires to make a change. Would lease or operate foundry upon profit sharing basis. Can command large jobbing trade. Best references. Well up in modern foundry practice, selling, estimating, prices, costs, mixture of metals from chemical basis, etc. Address "MANAGER," Box 382, Care THE FOUNDRY.

Personal.

James F. Mills, of the Abendroth Bros. Co., Port Chester, N. Y., has been elected president of the Port Chester Savings Bank.

Thomas A. Johnstone has resigned his position as foreman of the Clinton (Mass) Foundry Co., and accepted a similar position with Wm. Allen & Sons, Worcester, Mass.

George Denison, for several years in charge of the Atwood-Morrison Co.'s foundry, at Stonington, Conn., is now at the helm of the Standard Machinery Co.'s foundry, at Mystic, Conn.

David Spence has severed his connection with the Foos Manufacturing Co., of Springfield, Ohio, and accepted a position with the Nashua Iron & Brass Foundry Co., at Nashua, N. H.

The firm of Thomas A. Mack, Cincinnati, Ohio, has been dissolved. Mr. Mack has retired, and L. F. Walter and B. A. Wallingford, Jr., who have been connected with the old firm for a number of years, have succeeded to the business and will hereafter continue same under the firm name of Thos. A. Mack & Co.

Received from the Trade.

The Maywood Foundry & Machine Co., of Maywood, Ill., have issued a booklet of the Weiss molding machine manufactured by them.

The New York Air Compressor Co., 120 Liberty Street, New York, is distributing a catalogue of air compressors and compressed air machinery made by them.

The Wilbraham Baker Blower Co., of Philadelphia, issued a new catalogue Jan. 1, describing the Green Positive Pressure Blower.

The Chicago Pneumatic Tool Co. have issued a special edition of their catalogue describing in detail the large number of pneumatic tools and appliances made by them.

The Northern Engineering Works, Detroit, have issued a second edition of their Crane catalogue No. 11.

The J. S. McCormick Co., of Pittsburg, are mailing a pamphlet describing the Herman molding machine.

"Pictorial History of the Locomotive" is the name of an elegant book issued by the Chicago Pneumatic Tool Co., tracing in detail the progress of the locomotive from its earliest stages to the present day.

Who Have Tried it?

The demand for coke has become so great in the Connellsville region that cokemakers have been forced to try a new experiment. Good grades of foundry coke are burned seventy-two hours, and blast-furnace coke forty-eight hours. The McClure Coke Company and the Southwest Connellsville Coke Company have produced blast-furnace coke in twenty-four hours and foundry coke in forty-eight hours. It is said that the coke is being freely accepted by blast furnaces and foundries. Should the experiment be carried to any extent, the output of the Connellsville region can practically be doubled.

Except during a strike, coke has never been so high in price as at present. Contracts are being placed at $3 per ton f. o. b. at the ovens, and foundrymen are contracting at $3.50 and $4.00 per ton. It is expected that within two weeks 20,000 ovens will be fired in the Connellsville region, but this will not be sufficient to supply the demand.—Exchange.

Item from Staffords Spring, Conn.

Nathan Washburn, who has spent many years in the iron and steel business, has a furnace of his own invention which accomplishes wonderful results. By his process he takes cast iron car wheels and converts them so that they are harder than steel. He also is able to control the process so that while he converts the rim of the wheel he holds the center soft so as to allow it to be worked when placed on the axle. Mr. Washburn has treated four new wheels and two old ones for the Springfield street railway, and they have placed them on one of their cars for a thorough test.